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AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIV MARCH 23, 1925 NUMBER 5

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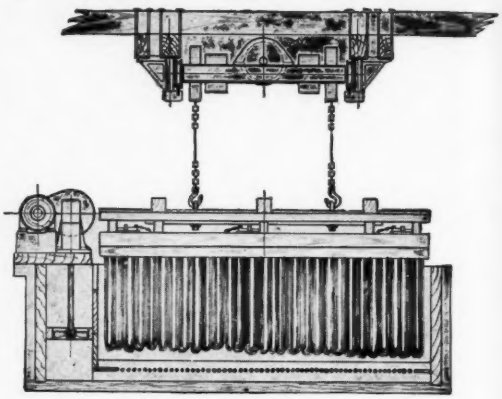

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VOLUME XIV NEW YORK, MARCH 23, 1925 NUMBER 5

Dyeing Acetate Silk

Part I

A Study of the Methods Which Have Been Used for Scouring, Bleaching and Dyeing Acetate Silk, As Well As the Various Dyes Used, Including the New Products Developed Particularly for This Fiber

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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[NOTE.—*The author is indebted to the following: Henry J. Bogan, of H. A. Metz & Co., has been particularly helpful with suggestions and data upon the Azonines, Azoniles and Dianils, as well as many of the more common dyestuffs. H. R. Davies, of the Dyestuffs Corporation of America, has supplied samples and much data on the Ionamines, Duranols, Coomassie and "C. R." Chlorazoles Dr. R. E. Rose, of the Du Pont Company, gave data on the Du Pont and Pontamine dyes. H. W. Mertin, of Kuttroff, Pickhardt & Co., furnished a color card on the Acedronoles, and Wm. E. Mitchell a color card showing the Ciba vat dyes on Celanese. The Lustron and Celanese companies kindly supplied samples of their products for experimental purposes*

Competent dyers will understand, of course, that all data and formulas are necessarily of a very general nature and must be varied according to the particular dye used and the conditions encountered.]

THE whole artificial silk industry is, comparatively speaking, a new one developed commercially almost entirely since 1890. In this new and rapidly growing industry the latest commercial development is cellulose acetate silk, acetyl silk, or acetate silk, as we will call it.

Cellulose acetate in itself is not a new product, having appeared in the literature about 1864, but as a textile fiber it is just now coming into its own. Anyone who doubts the future of this particular fiber has only to refer to the recent textile literature and patent records to see the rapidly increasing volume of data upon its manufacture, use, dyeing, etc., which is a good indication of the work being done along this line. Two entirely new classes of dyestuffs have been developed especially for use upon this fiber alone within the last couple of years. This research has possibly brought out more new facts regarding dyes and their application than any other research since the discovery of the vat dyes. All this has been extremely interesting as well as instructive and will in time no doubt have its effect upon bringing out new dyes and dyeing methods for the older and better known fibers.

We are all more or less familiar with the older varieties of artificial silks which have come into such wide use in recent years, their individual and collective properties, methods of dyeing, etc. Acetate silk is an entirely different product in that it is a cellulose ester and not merely a regenerated, modified or hydrated form of cellulose as are the older varieties of artificial silk. With this in mind we would expect quite different properties from the new product, acetate silk, and we certainly are not disappointed. The original Chardonnet silk was also an ester and had some properties in common with the acetate silk, but as this original Chardonnet was very flammable, one of the first improvements was a method of rendering it non-flammable by denitrating it. This denitration changed it from an ester to a hydrated cellulose, which chemically corresponds to the present Chardonnet silk. Before going farther, perhaps we had better consider the properties of acetate silk as compared with the other artificial silks and better known fibers.

PROPERTIES OF ACETATE SILK

Many of the properties of acetate silk are highly desirable in a textile fiber. It has a high luster; good tensile strength which far exceeds that of the other artificial silks when wet; an elasticity approaching natural silk; a soft, full, silky feel in the fabric; an extremely high resistance to microbiological injury such as mildews, molds and bacteria; a high thermal and electrical insulating value, etc. According to Bronnert the strength of acetate silk as compared with viscose and cuprammonium silks is shown below. The values for Chardonnet and natural silk are added from Matthew's Textile Fibers.

TABLE I

Variety of Fiber	Tensile Strength in Grams per Denier Dry	Wet	Per Cent Elasticity
Acetate silk	1.3 to 1.4	1.5	20
Viscose silk	1.3 to 1.8	0.4 to 0.8	15
Cuprammonium silk.	1.4	0.55	16
Chardonnet silk....	0.93		8
Natural silk	2.50		21.6

No details were available as to the conditions of the tests. However, Palmer, Textile Recorder 42, No. 500, p. 90 (1924) states that whereas artificial silk retains about one-third its dry strength when wet, acetate silk is two-thirds as strong wet as dry.

Acetate silk does not swell in either hot or cold pure water or in absolute alcohol, but swells in mixtures of water with alcohol or other organic solvents, and it is soluble in pyridine, acetone, tetrachlorethane, acetic acid, ethyl acetate and alcohol, and forms a jelly with chloroform, which latter is stated to be a convenient test for the hydrolyzed triacetate, which will be discussed later. While its resistance to hot or cold water is very high in certain respects, its resistance toward alkalies (especially the variety known as Celanese) and mineral acids is not as great as that of the other artificial silks. Little, AMERICAN DYESTUFF REPORTER, vol. 13, p. 6 (1924) states that acid hydrolysis affects acetate silk in much the same way in the initial stages as saponification (alkaline hydrolysis), but upon being carried to an extreme there is an actual disintegration of the fiber very similar to that which occurs in the case of cotton when sulphuric acid is left in it. This, of course, means complete destruction of its textile properties. It forms oxycellulose with oxidizing agents and its resistance to dry heat is similar to that of viscose silk or cotton, either at high temperatures for short periods or low temperatures for longer periods. Normally it contains about 5 per cent of moisture (condition), and even when wet it retains only about one-third to one-half as much water as the other artificial silks. This may partly account for its greater strength when wet. On account of its absorbing water more slowly and to a less extent than other fibers or artificial silks, stronger solutions must be used in treating it, as in diazotizing and developing, in dyeing, etc.

One of the principal difficulties with the other varieties of artificial silk has been their low tensile strength when wet. In fact, it has at times been more or less difficult to even dye or wet-finish some of the artificial silks without breakage or injury. In actual use in fabrics which were at all likely to become wet or even damp, such as clothing of all kinds, this was certainly a serious matter. With acetate silk, on the other hand, the fiber does not swell in water and wetting does not reduce the tensile strength to such an extent as with the other varieties.

Acetate silk does not lose its sheen or silky feel on washing, or turn yellow with age, sunlight, washing, wear or perspiration. It drapes well and is extremely regular. It has been stated that the fiber will not vary one denier either way in manufacture. Another of its properties, that of dyeing, has been a very great hindrance to its wide commercial use as a textile fiber.

Most textiles depend upon their color for much of their attractiveness. A fiber or fabric which may be readily dyed in all colors and shades of good fastness is in great demand as compared with other fibers with the same textile, physical and chemical properties, but which cannot be dyed in fast and attractive colors. Until very recently it was impossible to dye acetate silk in all colors of good fastness, due to its extreme reluctance in absorbing most of the fast dyes from the usual dye baths. This was possibly partly due to the high interfacial tension between water and cellulose acetate, especially the triacetate, which rendered it hard to evenly wet out the acetate silk with most dye baths, and partly to the fact that the dyestuffs are probably attached only to the acetyl group in the cellulose triacetate, according to Prof. Hibbert.

PREPARATION OF CELLULOSE ACETATE

Cellulose acetate may be prepared from cotton, wood or other cellulosic material, acetic anhydride, acetic acid and a catalyst such as sulphuric acid, phosphoric acid, zinc chloride, anhydrous acetates of zinc or manganese, chloracetic acid, dimethyl sulphate, etc., and there are to-day two varieties of acetate silk upon the market. The first product, "Lustron," is made by the Lustron Company of Boston, Mass. The variety known as "Celanese" is a more recent development, within the last five years to be exact, of the British Cellulose & Chemical Manufacturing Company, and is now made in quantity near Cumberland, Md., by the American Cellulose & Chemical Company of New York. While these two products have quite different chemical, physical and textile properties, they are both cellulose acetate and therefore have certain properties in common. It is understood that the Henckel Donnersmarck Works at Stettin, and others on the Continent experimented with the process but without commercial success.

These different properties of the two varieties of acetate silk are possibly due to a combination of the following causes: Slight differences in the chemical composition, i. e., the extent of acetylation, or proportion of mono-, di- and triacetate present in the fiber; differences in chemical methods used in manufacture, such as the solvents and temperatures; differences in the materials used, such as the starting material (wood or cotton), the catalyst, etc.; different mechanical methods of manufacture and spinning, such as spinning in air or a setting bath, etc. It can readily be seen that such differences in manufacture may combine to give very different products, as really happens in this case.

The completely acetylated cellulose, cellulose triacetate, is so hard to wet out evenly with water that it is almost impossible to wet it out completely and evenly in a practical way with an aqueous solution of the ordinary dyeing materials. While it has a high affinity fo

and absorbs certain of the older and more common dyes from aqueous solutions, these dyes are mainly of the basic group which is not noted for its fastness. However, even without mordanting some of these dyes show a greater fastness upon acetate silk than upon any known fiber. A few acid, mordant and other dyes are also absorbed. However, Paneth and Radu, Berichte der deutschen chemischen Gesellschaft 57B, p. 1221-5 (1924), state that Methylene Blue is adsorbed only on the surface of the fiber and in a monomolecular layer, in the same manner as on charcoal or diamond; and Ginsberg, AMERICAN DYESTUFF REPORTER, 12, 652 (1923), states that it took almost four months to completely dye acetate silk with Methylene Blue.

It is not clear to the writer just which variety of acetate silk, Lustron or Celanese, these workers used for their experiments, and inasmuch as Lustron has a greater affinity for basic dyes than Celanese, the variety may make some difference in the results. This difference in the dyeing properties of the two varieties of acetate silk with basic dyes follows with almost all of the dyes used. It has been stated that the Celanese silk as now made is not cellulose triacetate but corresponds to the diacetate and contains hydroxyl ions. The differences in the acetylation no doubt accounts for many of the differences in dyeing properties, dyestuff affinity, as well as in the other properties of the two varieties.

IDENTIFICATION OF ACETATE SILK

Acetate silk may be identified by the fact that it does not swell in water and by its dyeing properties. It is soluble in boiling acetone or cold acetic acid, but insoluble in ammoniacal copper hydroxide and is colored yellow by iodine and sulphuric acid or zinc chloriodide reagent. It is of low specific gravity and appears to melt rather than burn, giving a disagreeable odor and leaving a massive hard charcoal residue, while the other artificial silks leave a soft ash. Ginsberg states that if a sample of artificial silk is immersed in a solution of 3 per cent Methylene Blue and 2 per cent acetic acid, Chardonnet will rapidly assume a marine-blue color, quickly exhausting the bath, while cuprammonium and viscose silks are only slightly dyed and leave the remaining bath thick. Acetate silk will not be colored at all, but after soaking in diluted alcohol or other suitable swelling solvents, the dyestuff is quickly absorbed into the fiber. The Lustron and Celanese silks can be differentiated by a dyeing test, the Lustron having a greater affinity for strongly basic dyes than the Celanese, while the Celanese has a slightly greater affinity for most of the Ionamines.

Before taking up the dyeing of acetate silk, it might be well to review briefly the dyeing of the other artificial silks so as to make the comparison more obvious. All varieties of artificial silk have an affinity for basic dyes, but some have far more affinity than the others. In general the acetate silks have more affinity for the basic dyes that the other artificial silks, and the Lustron product has a greater affinity for them than the Celanese. The affinity of Chardonnet, viscose and cuprammonium silks for basic dyes decreases in the order named. While acetate silk itself has no affinity for the direct, sulphur and most of the vat dyes, these may be used on all of the other artificial silks.

DYEING CHARDONNET ARTIFICIAL SILK

The artificial silks known as Proxylin, Cadarat, Langhaus, du Vivier, Frankfurt, Soie de France, Meteor, Strehlenert, Besancon, Tubize, Collodion, Lehner or Chardonnet are nitrocellulose products. These silks, while manufactured in many different plants and having minute differences in some cases, are all very similiar in appearance and properties. They are more lustrous than natural silk but are stiffer and do not have the characteristic feel of natural silk. Chardonnet silk is dyed with basic dyes, with or without tannin which increases the color fastness to washing, direct cotton, vat and sulphur dyes. In using sulphur dyes, care must be taken to avoid loss of luster and strength.

It has a greater affinity for the stronger basic dyes than any of the other artificial silks except the acetate silks, even to high percentages without mordanting. This is possibly due to its hydrocellulose and oxycellulose content. For this reason acetic acid is used as a retard in applying many of these dyes. The weakly basic dyes show much less affinity and therefore are applied in high concentrations to give deep shades. In general it has less affinity for the direct dyes than either the viscose or cuprammonium silks.

DYEING CUPRAMMONIUM ARTIFICIAL SILK

Cuprammonium silk, known as Glanzstoff, Despaisis, Cuprate, Cupra, Julich, Givet, Crinol, Elberfeld, Aachen, Sirius, Aix la Chapelle, Pauly and Parisian artificial silk is made by the ammonium copper oxide process, and the different varieties are all similar in appearance and properties. They also have a very high luster, in some cases even more than the nitrocellulose silk, and its feel approaches that of true silk. They have less affinity for the basic dyes than the Chardonnet or viscose artificial silks, and for full shades the cuprammonium silk should be tannin mordanted. It has the highest affinity of the artificial silks for the direct cotton dyes which give good results on this fiber. Sulphur and vat dyes are also used but care must be exercised to avoid loss of luster. This artificial silk has a higher affinity for the weakly basic dyes than for those of strongly basic characteristics, which is just the reverse of the case with Chardonnet silk. In applying the weakly basic dyes to tannin mordanted cuprammonium silk, 5 to 10 per cent of acetic acid may be used in the bath, adding the dye to the bath gradually and raising the temperature slowly to avoid unevenness, to as high as 70 deg. Cent. (156 deg. Fahr.).

DYEING VISCOSE ARTIFICIAL SILK

Viscose or Du Pont silk is prepared from solutions of mercerized cellulose in caustic soda and carbon disul-

phide. It is an alkaline cellulose xanthate with a fine glossy appearance, and a tensile strength about equal to that of the Chardonnet silk, likewise it is weakened very materially in water. Its affinity for dyestuff is similar to that of mercerized cotton, and it appears to have an intermediary affinity for both the basic and direct dyes between the Chardonnet and cuprammonium silks. In other words, it has more affinity than Chardonnet silk for the weakly basic dyes, but less affinity than the cuprammonium. Basic dyes may be used for pale and medium shades without a mordant, but for heavy shades it should be mordanted and dyed with acetic acid. Vat dyes are also used.

Other Artificial Silks

Hammel's gelatine, Millar or Vendura artificial silk is composed of animal material, gelatine, and is therefore not a cellulose material. This fiber was patented in England in 1894, but has never appeared on the market.

The Casein or Todtenhaupt artificial silk is another English patent, 1904. It is prepared from an alkaline casein solution but has not appeared commercially. Thiocyanate artificial silk is another variety which has not yet appeared commercially and about which little is known.

Of the artificial silks, the gelatine and casein silks most closely approach natural silk in chemical composition, but as they are not in use little is known regarding their physical or dyeing properties; however, it has been stated that the fiber is very lustrous and in fine filaments is soft and pliable.

General Dyeing Formulas for Artificial Silks Other Than Acetate Silk

The general method of dyeing artificial silks, other than acetate silk, is to use substantive dyes in a short bath for about one hour at 49 to 60 deg. Cent. (120 to 140 deg. Fahr.) with 5 to 20 per cent of Glauber salt. When dyeing light shades 1 to 2 per cent of soda ash and up to 5 per cent of soap or Monopole oil are sometimes added to promote levelness and to soften the handle. Some acid dyes are also used but they are not usually fast to washing, and the basic dyes have such a high affinity for some varieties of the fiber that it is almost impossible to cause levelness with them. The basic dyes are usually applied at temperatures up to 40 deg. Cent. (104 deg. Fahr.) to the previously wet out artificial silk, with 2 to 5 per cent of acetic acid.

For heavy shades and really fast colors a tannin and tartar emetic mordant should be applied to the artificial silks, with the exception of acetate silk, in the same manner as cotton in applying the basic dyes. Steep the goods in a mordanting bath containing up to 5 per cent tannic acid and 1 per cent hydrochloric acid at 60 deg. Cent. (140 deg. Fahr.) for several hours, hydroextract and fix in a bath containing about 1 per cent tartar emetic. If particularly fast colors are wanted, such as for cross dyeing, the basic dyes should also have a top mordant by repeating the above process after dyeing. Basic dyes are often used to top the substantive dyes on artificial silk, thus brightening the shade.

The sulphur dyes are also used on artificial silks, and are applied in about a 25 to 1 dye bath containing the same quantity of sodium sulphide as dyestuff, 1 to 4 per cent of soda ash and 5 to 25 per cent sodium sulphate, and are dyed at 38 to 49 deg. Cent. (100 to 120 deg. Fahr.) for about an hour. Copper vessels must not be used. The phthalein dyes, Eosin, Erythrosine and Rose Bengale are applied to artificial silks at about 38 deg. Cent. (100 deg. Fahr.) in a short bath containing about 20 pounds of sodium chloride per hundred gallons. Some vat dyes have also been used for these artificial silks, but in general they have less affinity for the nitrocellulose than the viscose and cuprammonium silks.

Really good deep blacks on the ordinary artificial silks are usually obtained by first dyeing with Diazo Black, diazotizing with sodium nitrite and hydrochloric acid, and then developing with beta-naphthol or phenylenediamine, in the same manner as in cotton dyeing. Brown shades of good fastness to washing and cross dyeing may be obtained with Primuline and a Diazo Black, diazotized and developed with resorcinol or phenylenediamine. Brown shades of good fastness to light may be obtained with sulphur dyes.

The fact that acetate silk could not be dyed really fast shades by any of the foregoing methods greatly hindered its use in the textile industry except for white stripe effects, etc., and where color fastness requirements were not rigid.

(To be continued)

KALI ISSUES BOOKLET ON TEXTILE CHEMISTRY

A recently published booklet of unusual practical value, entitled "Popular Textile Chemistry," by James A. Branegan, president of the Kali Manufacturing Company, deals with all the chemicals used in the dyehouse, describing their composition and manufacture. It is written in a simple, interesting style for the layman and should prove of value to the dyer and to the purchaser of textile chemicals. For the benefit of those desiring copies of this booklet the Kali Company will have order cards to be filled out at their booth, No. 163-164, at the Knitting Arts Exhibition in Philadelphia during the week of April 6th.

Various oils for degumming and dyeing silk will be featured at the booth of the Kali Manufacturing Company during the exhibition. The principal products on display will be the One-Bath Boil-Off Oil, used on hosiery composed of silk and mercerized; Three-Fiber Boil-Off Oil for boiling off and dyeing at the same time hosiery composed of pure silk, art silk and mercerized cotton or wool; Art Silk Boil-Off Oil for boiling out and holding in suspension the oils used on artificial silk for coning and winding, particularly where kerosene and other mineral oils are used, the dyeing being done at the same time; Developene; Kali Chlorine Neutralizer, and Hydroxy Coning Oil for artificial silk.

Scientific Washing

VIII—Water, Its Use in Textile Washing*

Removing Temporary Hardness—Lime and Soda Process—Zeolite Softeners and Temporary Hardness—How Permanent Hardness Is Removed—Why Caustic Is Not Used—The Chemical Reactions of Softening—What Zeolite Softeners Do—How Soft Water Saves Money—Operating Suggestions for Zeolite and Lime and Soda Processes—Finding Hardness—Steam Making Troubles—Hard Water in the Final Rinse

By F. H. GUERNSEY

Cowles Detergent Company

IN cases where hardness in water consists largely of temporary hardness, the "lime and soda" softener is effectively and economically employed.

The "lime and soda" method involves the treatment of the water before use with lime water or caustic soda which converts the soluble bicarbonate to insoluble compounds as seen in the table of exchanges in Part 1. Magnesium sulphate and magnesium chloride are converted into the more insoluble hydroxide by either caustic soda or lime water. When the latter is used, soda ash must also be added to precipitate the lime. It is more desirable to remove the magnesium in the form of the hydroxide because of its flocculent character, which in settling down drags many other substances suspended in the water. The insoluble by-products are allowed to settle out and the water is then ready for use.

There are many cases where advantage may be taken of the fact that bicarbonates are changed to the normal carbonate by the action of heat in splitting off carbonic acid (carbon dioxide gas and water). The lime and magnesium carbonates, being insoluble in water, will settle out. This explains why water containing temporary hardness becomes cloudy on heating.

Lime and Soda Process Has Objections

This process is troublesome and more or less unreliable. The excess of lime which frequently results is highly objectionable, and an excess of alkali likewise has its unsatisfactory features. Care should be taken to calculate exact amounts of the water treating chemicals.

This process does not produce zero softness. Its chief recommendation is that it effectively removes irons, acids (such as carbonic) and some other impurities found in natural waters.

How Zeolite Softeners Act on Temporary Hardness

In the zeolite softeners (discussed more fully later) the temporary hardness is converted into calcium zeolite and magnesium zeolite. This is retained in the filter bed. Sodium bicarbonate is formed in the water in exchange for the calcium bicarbonate and magnesium bicarbonate. *If the degree of temporary hardness is high, a correspondingly high concentration of sodium bicarbonate will be present and it is possible that the amount will lead to trouble in rinsing.*

Some plants have found it necessary to install a softening outfit comprising both the lime and soda apparatus, and the zeolite apparatus to take care of this condition. The practice of souring lightly with acetic sour in the last rinse is also employed.

How Permanent Hardness Is Removed

Two methods are commonly employed in the removal of permanent hardness. In one, certain chemicals such as soda ash are added directly to the water in the washer. This brings about a chemical change whereby the soluble sulphates and the chlorides are converted to carbonates. The latter are insoluble and thus can be removed from the water, or if left in it, do not consume detergents. The most efficient alkalies for this method of softening in laundry practice are trisodium phosphate, carbonate of soda, or mixtures of these two.

Roughly speaking, about one ounce of these materials should be added to the laundry washwheel for every 2 or 3 degrees of hardness per 100 pounds of goods. A 36-inch by 54-inch washwheel contains about 40 gallons of water when there are 3 inches inside the cylinder. The materials can be added directly to the water and should precede the soap and other detergent.

If the water is cold, the softening reaction does not take place within the time which is usually allowed the break, five minutes. Even in hot water, fully ten minutes are required to get any considerable water softening value out of these materials.

Bear in mind that the addition of the above materials to the washwheel *does not remove* the hardness from the water—it simply changes the form. The precipitate tends to lodge in the goods and will cause gray work if not properly handled. For this reason it is well to carry a liberal suds to aerate the cloth layers, lubricate the particles and facilitate their removal with the discharging water.

*The first section of Part VIII, also treating of water softening, appeared in Vol. XIII, No. 13.

Why Caustic Is Not Used for Permanent Hardness

The question sometimes arises: "Can I soften water with caustic soda?"

Caustic is not a complete water softener because of the small amount of carbonate formed through its use. As carbonate is essential to the major reactions in removing permanent hardness caustic is not very effective on permanent hardness. Caustic is of value, however, in treating waters containing magnesium permanent hardness and calcium temporary hardness, as the following reactions indicate. The only Na_2CO_3 (soda ash) available when softening with caustic is derived from equations 1 and 3. However, when there is no soda ash available for water softening and the water is extremely hard, caustic alone is better than nothing, provided it is used with discretion.

What the Chemical Reactions of Softening Are

The following are two typical reactions which take place when soda ash is used to precipitate permanent hardness:

Soluble Calcium Sulphate plus Soda Ash forms Insoluble Calcium Carbonate plus Soluble Sodium Sulphate.

Soluble Calcium Chloride plus Soda Ash forms Insoluble Calcium Carbonate plus Table Salt in solution.

Modified sodas, which contain soda ash, behave in a manner similar to soda ash, but twice as much material is required.

For the benefit of the reader who is technically inclined, a more extended list of the principal reactions of water softening is given:

Temporary Hardness

(Soluble Products roman; Insoluble Products italicized)

1. $Ca(HCO_3)_2 + 2NaOH = \mathit{CaCO_3} + Na_2CO_3 + 2H_2O$.
2. $Ca(HCO_3)_2 + Ca(OH)_2 = \mathit{2CaCO_3} + 2H_2O$.
3. $Mg(HCO_3)_2 + 4NaOH = \mathit{Mg(OH)_2} + 2Na_2CO_3 + 2H_2O$.
4. $Mg(HCO_3)_2 + 2Ca(OH)_2 = \mathit{Mg(OH)_2} + \mathit{2CaCO_3} + 2H_2O$.

Permanent Hardness

(Soluble Products roman; Insoluble Products italicized)

5. $CaSO_4 + Na_2CO_3 = \mathit{CaCO_3} + Na_2SO_4$.
6. $CaCl_2 + Na_2CO_3 = \mathit{CaCO_3} + NaCl$.
7. $MgSO_4 + 2NaOH = \mathit{Mg(OH)_2} + Na_2SO_4$.
8. $MgSO_4 + Ca(OH)_2 + Na_2CO_3 = \mathit{Mg(OH)_2} + \mathit{CaCO_3} + Na_2SO_4$.
9. $MgCl_2 + 2NaOH = \mathit{Mg(OH)_2} + 2NaCl$.
10. $MgCl_2 + Ca(OH)_2 + Na_2CO_3 = \mathit{Mg(OH)_2} + \mathit{CaCO_3} + 2NaCl$.

What Zeolite Softeners Do

A more efficient water softening method than that of adding materials directly to the water in the machine provides for passing the raw water through a bed of mineral called "zeolite."

Zeolite softeners convert the soluble hardness into insoluble calcium and magnesium zeolite, soluble sodium sulphate, and sodium chloride. To do this the zeolite compound exchanges its sodium for the calcium composing the hardness, and the calcium thus becomes separated from the water, remaining as part of the zeolite bed. The new sodium compound thus formed remains in the water, but is relatively harmless at the usual concentrations.

The caclium and magnesium zeolite has the peculiar faculty of exchanging its calcium back for sodium when subjected to the action of a concentrated solution of salt. This is fortunate, for to rejuvenate the zeolite after it becomes loaded with the minerals that compose the hardness, it is only necessary to pass salt solution through it.

A typical formula would show the zeolite reactions as follows:

$$CaZ + NaCl = NaZ + CaCl_2 \text{ (Rejuvenation)}$$
$$2NaZ + CaSO_4 = CaZ + Na_2SO_4 \text{ (Softening)}$$

Great care must be exercised in the operation of zeolite systems to insure the proper removal of all salt from the treated water. When it is remembered that salt is used in the manufacture of soap to cause the latter to separate from solutions, the evil effects of allowing suds water to be contaminated by salt are apparent. Much soap will be wasted in attempting to get up a suds in salt water.

It must not be concluded that the elimination of hardness from water removes the necessity of using other detergents than soap in the washing process. This was an error into which many mills fell shortly after zeolite softening apparatus came upon the market. There seemed to be a general belief which still persists in the minds of some men that, when water is made neutral, nothing but soap is required as a detergent.

The preliminary softening of water merely eliminates the waste that goes on when softening with valuable detergents. To illustrate this, it has been positively established by scientific investigators that the use of an alkaline assistant with soap is decidedly beneficial even when washing in distilled water which is free from impurities.

Hardness can be pictured as an invisible monster in the water with a greedy appetite for soap and other detergents. This appetite must be satisfied before any portion of the detergent be available for cleansing the goods. To remove this monster, known as hardness, means that the mill has made it possible to save a portion of the detergents which has hitherto been consumed uselessly.

Detergent energy in the form of hydroxyl ion alkali, plus the colloidal effect such as that furnished by soap and Escolite, is necessary whether the water be softened before going into the washers, or afterwards.

It is well to remember that approximately 80 per cent of soda ash, and a larger percentage of soda, does not make itself felt in the washing reaction. This is the percentage which does not break up or hydrolyze to basic

alkali (see Part 3, Alkali), but remains as a carbonate unless there is permanent hardness present with which it can react. Consequently, these materials cannot be considered an efficient source of detergent energy to reinforce soap in soft water.

Zeolite Operating Suggestions

Certain minerals which occur in water at times are unusually destructive to zeolite. Frequent test of water should be made, and if it is suspected at any time that a softener of this style is not functioning properly, steps should be taken to find out the exact situation. To consider that the bare installation of a zeolite softener puts an end to all troubles, and brings about the day of perfect peace is a costly mistake. The apparatus must be looked after regularly and expertly.

As a precaution, the following suggestions are made. When the softening plant is first put in operation or when new zeolite is added, watch the condition of the water carefully. The sodium salt which is formed as a by-product in the zeolite softening reaction is soluble and harmless under normal conditions. If the apparatus does not function properly, or if water was high in temporary hardness, this sodium salt may be present in excessive quantities. Salt should be eliminated by thorough flushing. In some plants a few ounces of acetic acid are used in the last rinse when it is found that the zeolite water has a high alkaline showing. This is the safest corrective because any excess acetic evaporates under the heat of ironing. Its salts are soluble, too, and do not accumulate in the goods in the successive washes.

"Lime and Soda" Operating Suggestions

Just sufficient lime should be added to cause the chemical action between the lime and the raw water to go to completion. An excess of lime should be avoided as the hardness and alkalinity will then be increased. The quantity of lime required is determined by making soap tests after successive additions of lime, until it is noted that the hardness has passed through a minimum point and begins to increase. When the minimum point with lime is reached, the addition of soda ash is begun until a minimum hardness as shown by the soap test is reached. An excess of either lime or soda ash should be avoided.

How to Find Out the Hardness of Water

There are several standards for measuring the hardness of water. They usually specify in terms of the equivalent effect of calcium carbonate, though there may be any number of compounds present. What is known as the English, or Clark scale, and the American scale are the most common. The former expresses the hardness in grains of calcium carbonate per Imperial gallon, the latter per U. S. gallon.

One degree of hardness is understood to be that amount which is due to the presence of one grain of calcium carbonate, or its equivalent of any similar salt, in solution in one U. S. gallon of water. The term "degree" is the common form of expression. "Six degrees" would have the same meaning as "six grains" per U. S. gallon.

Steam Making and Its Troubles

One of the chief uses of water is the making of steam. Its value for this purpose is governed by the amount and the chemical character of mineral matter that is dissolved and suspended in it. The troubles in boiler-room practice caused by the mineral constituents of natural waters are scale formation, corrosion and foaming.

These articles are intended to cover washroom practice chiefly, and therefore but comparatively brief reference will be made here to these troubles of the boiler room, and their correction:

Scale.—This is formed by the depositing of mineral matter within the boiler shell. Probably one-fifth of the steam generators in the country are defective on that account. In using a water like that of the Mississippi River, without condensers and under ordinary conditions in a plant developing 1,000 h.p., the scale itself would amount to a ton in twenty working days of twenty-four hours each.

Corrosion or Pitting.—This is caused chiefly by the solvent action of carbonic and organic acids and electrolysis. The presence of salt in the water will increase the rate of corrosion by increasing its conductivity.

Foaming.—This consists of the formation of masses of bubbles on the surface of the water and in the steam space above it. Foaming is frequently brought about by organic matter causing a scum to gather on the surface of the water. The presence of carbonates or bicarbonates in the water promotes foaming.

There are few boiler compounds which are effective in offsetting boiler troubles caused by suspended matter. Some compounds are efficient, while others are positively injurious. Mills should counsel an authority and not buy boiler compounds, except on advice of a competent man *after careful analysis of the water.*

This plan will save many a dollar in the long run and insure better operation of the steam-making equipment.

A good boiler compound should: First, reduce corrosion; second, prevent priming or foaming; third, prevent scale formation.

It would be worth while to study the article on "Internal Treatment of Boiler Water—Proper and Improper," by D. K. French, in the Journal of Industrial and Engineering Chemistry, December, 1923, page 1239. This is a splendid article written so anyone can understand it. A copy can probably be obtained at your public library.

Hard Water in the Final Rinse

The use of hard water in the final rinse offers ground for discussion. Advocates of the hard water final rinse doubtless base their conclusions on the "feel" of the water and the showing of suds at the extractor discharge, both

of which indicate the presence of soap in the goods. Moreover, some claim to have observed lint and other evidence of alkali concentrated in the goods at the ironer.

On general principles it is very poor practice to use hard water in any part of the washing operation, for reasons already stated. Remembering that the function of the rinse is to remove *all* foreign substances from the goods, it is obvious that a pure neutral water should be used so as not to cause any chemical reaction that will deposit compounds in the fabric. Hard water causes disappearance of suds from the extractor discharge, but this has been done at the expense of locking the soap in the fabric as lime soap. Consequently, there is a larger amount of foreign matter in the goods than when the final rinse consists of soft water and the discharge still runs a suds. Lime has been *added* instead of soap being *subtracted*.

When the water originally contained temporary hardness, the sodium bicarbonate introduced during the softening process is converted to soda ash under heat. This would take place at the time moisture is driven off during ironing. While it is doubtful if there would be enough soda ash under ordinary circumstances to cause any trouble with yellow streaks or tendered fibers, the mill should investigate carefully to determine the amount present in the softened water. If high enough to be troublesome, the use of acetic sour as explained in the chapter, "Zeolite Operating Suggestions," is recommended.

A final rinse with hard water in this case does not neutralize the alkalinity—it merely dilutes it and cannot be considered good practice.

Iron as a Cause of Yellow Work

Iron is a most undesirable dissolved constituent of water. Comparatively small quantities necessitate purification for almost every use that is contemplated for the water. In all cleansing processes where soap and alkali are used, precipitated iron is likely to cause rusty or dull spots. Waters containing even as small as one or two parts per million of iron are apt to cause trouble.

The use of caustic in water containing an appreciable amount of iron should be avoided on account of the tendency toward formation of the reddish brown iron hydroxide.

If a water supply that has been giving satisfactory results suddenly shows a tendency to produce yellow work, an investigation should be made of the hot water system or of the washing machine itself. A loose joint may be causing rust and the presence of iron oxide in the water supply.

Where work has become yellow through the effect of iron, the use of oxalic or other iron solvent is necessary. There are safe rust removing agents available whose use is recommended.

The cause of the iron in the water should be located and removed as quickly as possible. All too frequently the washing material is blamed for the yellowed work caused by iron.

As a rule, when the goods are yellowed as a result of iron contamination in the water, the yellowish cast is spread evenly throughout the article. A yellow color due to improper rinsing is usually uneven and streaked. Very often alkaline water from zeolite softeners when used in the last rinse causes the discoloration by iron to be more pronounced. A slight souring by acetic will do much to prevent this.

A practice which is to be condemned is the use of a hard or lime bleach (not soda bleach). When hard bleach is added to the washer the water therein is made artificially hard. The calcium in the bleach acts exactly like the calcium in naturally hard water. Trouble may be expected both as a result of this hardness and owing to the fact that the calcium hypochlorite is likely to burn holes in the goods.

AMERICAN TANNERS' DYES CHEAPER THAN FOREIGN

American dyes used by calf leather tanners in the United States cost less than the foreign products used by tanners abroad, according to a report published by the Bureau of Foreign and Domestic Commerce in co-operation with the Tariff Commission. Although the dye requirements of the calf tanners accounted for less than three-fifths of one per cent of the total United States production of dyes in 1923, yet the results of this investigation made by the Bureau of prices of tanners' materials offer some interesting arguments for the manufacturing skill of our dye industry. The report says in part:

"Fourteen dyes used as the basis of the investigation comprise 90 per cent of the total quantity and value of all the coal-tar dyes consumed by domestic calf tanners. Six of the fourteen dyes, Bismarck Brown, Direct Deep Black EW, Nigrosine WS, Phosphine, Resorcine Brown and Orange II, account for seven-eighths of the tanners' requirements. The entire requirements of our calf tanners for the fourteen dyes are met by products of American manufacture.

"It was found that the dyes used by Austria, Belgium, Czecho-Slovakia and Dutch calf skin tanners are of German origin and subject to an agent's or distributor's profit; therefore our field was narrowed, to a value comparison between the dyes of English, French and German origin with those produced in the United States.

"We find that American prices of the fourteen dyes are comparable with those prevailing in these countries of Europe, and for the six major dyes enumerated above which make up seven-eighths of the United States calf tanners' demand, the American price is not only comparable, but, in most instances, lower than the price which his competitor in Europe must pay."

Surveys of Recent Progress in the Dyeing, Printing and Allied Industries

Vegetable Fibrous Materials

Cellulose—Cotton—Flax and Other Bast Fibers—New Fibrous Materials—Paper and Paper-Making Fibers—Testing

By J. HUEBNER, M.Sc. (Tech.), F. I. C.

[NOTE.—*This survey, reprinted from the Journal of the Society of Dyers and Colourists, February,* 1925, *gives such a complete record of recent progress along textile chemical lines that we believe it will be of interest and value to the readers of the* REPORTER.—ED.]

IN the following review an attempt has been made to collect, as far as possible, all the work relating to vegetable fibrous materials which has been published during the last ten years.

The writer hopes that it will be realized that it is difficult, and in some cases impossible, to give abstracts in this very condensed form, which will convey a clear idea of the contents of each publication reviewed. He nevertheless hopes that the review will be of value to those engaged in work upon this subject and that it will save their time when searching the literature.

In order to save space, the references given in the review are in all cases to this Journal, where further references to the original publications will be found.

CELLULOSE

E. Knecht and A. Lipschitz (1914, 154) have found that the action of strong nitric acid (83 deg. Tw.) on cotton takes place in two stages. The first and almost immediate reaction is the formation of a labile nitrate, the slower secondary reaction consists of staple nitrate formation, the nitrogen content increasing to a maximum and then by continued contact with the acid decreasing until negligible. They also point out that cotton treated with strong nitric acid exhibits a greater affinity for all classes of coloring matters.

A paper on cellulose and ligno-cellulose, by C. F. Cross, which contains a large amount of valuable information, was read at a meeting of the Manchester Section of the Society (1914, 346).

The tendering of cotton by organic acids in steaming has been investigated by G. E. Pilkington (1915, 149). The degree of tendering has been ascertained by means of the copper values. A very detailed account of the method used is given.

A further contribution on the same subject is made by M. Fort (1915, 165), in a letter to the editor, entitled "The Influence of Neutral Salts and the Tendering of Cotton with Acids."

M. Cohen (1915, 162), in a communication on "The Action of Mineral Acids on Cotton," comes to the conclusion that the reduction of Fehling's solution gives a fairly accurate idea of the tendering action of acids upon cotton.

M. Fort and F. Pickles (1915, 255) have investigated the tendering of cotton by solutions of acids and salts as well as the combined action of acids and salts. They conclude that the addition of a salt of the same acid to a solution of an acid, causing reduced electrolytic dissociation of the acid, also causes a corresponding reduction in the tendering action on the cotton. The addition of a salt of a weaker acid to the solution of an acid, resulting thereby in a large amount of weak feebly-ionized acid, also results in a decreased tendering action on cotton. They also conclude that the use of magnesium sulphate in size, along with a considerable amount of a soluble chloride, is open in some degree to all the objections raised against magnesium chloride itself.

H. Wilkinson (1917, 148), in ascertaining the action of sulphuric acid on cotton, has come to the conclusion that the tendering action increases the longer the acid remains upon the fiber; that the cotton regains strength very considerably on washing out the acid, and that neutralizing of the acid by steeping in an alkaline solution, followed by washing, gave results similar to those obtained by washing with water only.

S. H. Higgins (1918. 35) has investigated the cause of tendering of bleached cotton and linen yarns which have been badly scoured. He shows that scouring removes the waxes and other impurities, that cream yarns contain a large amount of wax which is of a dark color, and that thorough scouring is essential in order to prevent yellowing on storage.

H. Moore (1915, 180) has investigated the action of some oxidizing agents on cellulose with a view to ascertaining the quantitative relationships between the concentrations of solutions of various oxidizing agents and the amounts of oxycellulose formed with these solutions under varying conditions.

E. Knecht and L. Thompson (1920, 251) describe the preparation of highly oxidized cellulose. The properties of the product have been fully investigated.

The same authors (1920, 255) describe a method of estimating the reducing values of cellulosic substances, which is more rapid than Schwalbe's method.

E. Knecht (1921, 76) has investigated the behavior of highly oxidized cellulose toward direct cotton colors. He found that it was possible to restore the dyeing properties of the oxycellulose by treatment with caustic soda.

In a paper, entitled "Some Observations on the Behavior of Oxidized Cellulose," E. Knecht and F. P. Thompson (1922, 132) show the quantitative relation between the degree of oxidation and the reducing power and the effect of oxidation on the ester reactions.

E. Justin-Muller (1922, 209) has investigated the comparative action of heat on cellulose, hydrocellulose and oxidized cellulose. He suggests that hydrocellulose can be detected by the application of dry heat.

A very useful summary of the work published on oxycellulose, its formations and reactions, has been compiled by P. H. Clifford and R. G. Fargher (1923, 21).

O. Hauser and H. Herzfeld (1916, 48) consider that hydrocellulose is an adsorption compound of variable composition and that it consists of cellulose combined with its products of hydrolysis.

K. Hess and W. Wittelsbach (1920, 263) suggests the name "celluxose" for the molecule of hydrocellulose. The suggestion is also advanced that it consists of a dextrose or cellobiose molecule in which the hydroxyl groups are etherified by dextrose or cellobiose residues.

The action of dilute mineral acids on cellulose has been studied by A. Wohl and K. Blumrich (1921, 171). They have determined the copper numbers of the residue and of the solution at various stages, when cotton cellulose is hydrolized with hydrochloric acid.

H. Ost and R. Bretschneider (1921, 312) have come to the conclusion that the comparative examination of hydrocellulose and cellulose before and after treatment with boiling water indicates that hydrocelluloses are individual substances and not mixtures of cellulose and cellulose dextrine.

The fluorescence of cellulose and its derivatives has been very exhaustively investigated by S. Judd Lewis (1918, 167). He has found that substances, such as paper and cotton fabric possess comparatively strong fluorescent properties. He has come to the conclusion that the character of the fluorescence must be intimately associated with the molecular structure.

Some further interesting information is contained in three papers by S. Judd Lewis (1922, 68; 1922, 99; 1924, 29; 1924, 111) on a quantitative determination of the fluorescent powers, "The Spectro and Fluorescometry" of cellulose, sugars and other substances.

J. Daniel and F. G. Benoist (1916, 192) prepare pure cellulose by treatment with a mixture of trichlorethylene and an alkali.

A. Leighton (1916, 192) has shown that sulphuric, phosphoric and hydrochloric acids are absorbed by cellulose in decreasing amounts in the order given.

J. Sarasin (1918, 207) has examined the products of decomposition by heat of cellulose and starch. He concludes that starch and cellulose are polymerides of 1-glucosan.

E. Heuser and A. Haug (1918, 251) have studied the nature of cellulose from corn straw. They have found that some of the reactions given by other investigators are either not given by purified straw cellulose or they are quite different.

C. F. Cross and E. Bevan (1919, 232) have patented the treatment of fibrous cellulose for the production of hydrated derivatives. The fibers are treated with caustic soda between 6 and 11 per cent straight, accompanied or followed by treatment with carbon disulphide.

A review, entitled "Colloid Chemistry in the Textile Industries," by W. Harrison (1919, 243), contains a large amount of valuable information as well as a very complete bibliography of the subject, which investigators will find of considerable use.

P. E. C. Goissedet (1919, 262) has patented the production of phenyl carbamic ester of cellulose.

F. Fischer and W. Schneider (1920, 184) have found that when cellulose is heated with benzene under pressure a gradual decomposition occurs, and water and products which dissolve in the benzene are formed.

In a lecture delivered before the French Chemical Society, A. Pictet (1920, 285) describes the results obtained on distilling cellulose at a low pressure. He shows how this can be interpreted so as to throw new light on the constitution of cellulose.

P. Rona and L. Michaelis (1920, 285) have suggested that the more marked adsorption of electrolytes, such as dyes, by cellulose, is attributed to the mineral content of the cellulose.

During 1920, C. F. Cross (1921, 13) delivered a series of Cantor Lectures before the Royal Society of Arts on "Recent Research on Cellulose Industry" which contain a large amount of useful information.

The action of perhydrol on cellulose has been studied by R. Haller (1921, 22).

R. A. Punter (1921, 89), in a report of investigations carried on during the war into the manufacture of nitrocellulose from cotton waste, states that cellulose in different raw cottons has very different viscosity.

P. Waentig and W. Gierisch (1921, 121) have found that fibers for spinning can be obtained from flax bast and hemp tow, as well as from very thin wood shavings by the action of chlorine gas.

K. Hess and E. Messmer (1921, 217) have contributed a paper on the asymmetric structure of cellulose and the influence of Schweitzer's reagent on the rotation of carbohydrates.

R. O. Herzog and W. Jancke (1921, 217) have shown that interference-figures which are characteristic of crystalline structure are obtained when cotton, ramie, wood cellulose, artificial silk powder, etc., are examined by Roentgen rays.

C. A. Braun (1921, 234) has patented a process for the manufacture of spinning fibers from wood, jute, manila hemp and nettles.

The action of thiocyanates on cellulose has been very thoroughly and systematically investigated by H. E. Williams (1921, 312).

A. C. von Euler (1922, 18) discusses the important

facts which must be taken into account in any structural formula for cellulose, and draws attention to the directions in which all structural formulae hitherto proposed are unsatisfactory. He suggests two variations of a new constitutional formula for cellulose.

L. Lilienfeld (1922, 51) has patented a process for the manufacture of alkali cellulose, poor in water, and containing an excess of alkali.

J. Huebner and F. Kaye (1922, 145) have found that highly purified cotton or other celluloses when exposed to the action of water at a temperature of about 35 deg. Cent. yields soluble compounds which are aldehydic in character.

E. Knoevenagel and H. Burch (1922, 228) have produced an alkali soluble modification of cellulose by treating viscose cellulose with mineral acid.

A further communication by R. A. Joyner (1923, 21), on the viscosity of cellulose, contains a large amount of new and valuable information.

Burgess, Ledward & Co. and W. Harrison (1923, 157) have patented the production of cellulose derivatives containing inorganic acidic groupings which are not decomposed by water or caustic alkalies.

A further communication on the appearance of natural fibers when examined by Roentgen rays has been made by R. O. Herzog (1923, 220).

Heuser and Jayne (1923, 220) have determined the molecular weight of a dimethylated derivative of a hydrocellulose.

An attempt has been made by J. S. Ross and J. M. Payne (1923, 221) to condense chloral with cellulose in order that the condensation products might be studied as to their relation to the molecule of cellulose.

J. Huebner and J. N. Sinha (1923, 251) have investigated the action of iodine upon celluloses, silk, wool, artificial silks, rubber and other substances. They have found that the different celluloses show marked differences in their behavior toward certain dyestuffs and that all these substances readily yield iodoform. The results seem to indicate that the amount of iodoform produced has some definite relation to the solubility of the different celluloses in caustic soda.

In a paper on the saccharification of cellulose, P. P. Budnikoff (1923, 284) gives first a resume of previous work and then describes experiments in which it was attempted firstly to obtain glucose solutions of higher concentration, and secondly to separate the acid from the sugar without precipitating it with barium or calcium salt.

J. O. Small (1923, 348) has described a method for determining the viscosity of cotton cellulose in ammoniacal cupric oxide solution.

K. Hess (1923, 367) suggests that cellulose is dissociated in ammoniacal cupric oxide solution to $C_6H_{10}O_5$. X-ray examinations show that this change is not attended by alterations in the chemical structure of the cellulose.

A further communication on the action of chloral on cellulose has been made by J. H. Ross and J. M. Payne (1923, 375).

A report on recent investigations on cellulose has been compiled by E. Dorr (1924, 16). He concludes by stating that at present cellulose is considered a complex alcohol, probably built up from cellobiose anhydride. This, however, does not account for the formation of isosaccharic acid from oxycellulose nor that of celloisobiose.

An investigation into the action of highly concentrated hydrochloric acid on cellulose and on some derivatives of glucose and xylose has been carried out by E. L. Hirst and D. R. Morrison (1924, 91).

C. G. Schwalbe and R. Schepp (1924, 121) have found that wood cellulose when heated with strong solutions of magnesium chloride in an autoclave is strongly carbonized.

J. O. Small (1924, 187) gives a number of factors which are believed to influence the viscosity of cotton, from the growth of the cotton plant until the purification treatment has been completed.

S. A. Mahrood and T. L. McMeekin (1924, 193) have attempted to determine cellulose quantitatively by conversion (1) into levulic acid and (2) into hexoses. The hexoses have then been oxidized with iodine and the excess of iodine has been ascertained by titration with thiosulphate.

It has been suggested that the deterioration of ancient documents is partly due to the colloidal iron in the inks used. H. S. Bolton and C. Doree (1924, 292), however, state that colloidal iron has no action on cellulose fibers.

Cotton

Attempts have been made in the United States to grow natural colored cotton and it is believed to be a possibility to grow black cotton (1915, 227).

The production of imitation wool effects has been patented by Tootal Broadhurst Lee Company and J. H. Lester (1917, 64). Mixtures of cotton dyed different shades are spun and then shrunk with caustic soda or other agents.

J. H. Barnes (1917, 42) has found that certain Indian cottons contain up to 0.014 per cent of magnesium chloride, and that the total amount of ash in some cases reaches 3 per cent on the dry lint.

M. Fort (1918, 9, and 1924, 142) has noticed the conversion of cotton fiber into a powder by the action of heavy beetles.

The results of the investigation of this powdered cotton by C. F. Cross and E. J. Bevan (1918, 215) are given in a communication read before the West Riding Section of the Society on September 26, 1918.

The same authors (1918, 247) have also investigated some dust and granules taken from the middle of a cotton rope.

G. Heller (1919, 105) has investigated the behavior of cotton in various degrees of purity in solutions of aluminum and lead salts.

The elimination of nitrogen from vegetable fibers in the bleaching process has been studied by S. H. Higgins (1919, 165).

G. Durst (1919, 261) has shown that bleached cotton

absorbs about 0.9 grms. of alumina per kilogram when steeped in a solution of aluminum acetate.

N. Fleming and A. C. Thaysen (1920, 244) state that bacterial action is responsible for the deterioration of cotton which becomes damp during storage, and that this action is stopped if the water content is reduced to 9 per cent.

In order to obtain sections of yarns and of fabrics, R. S. Willows and A. C. Alexander (1921, 195) suggest immersion of the material in a solution of cellulose acetate.

The effect of scouring, and of the various methods of bleaching, on the structure and the strength of cotton fabrics has been investigated by J. Huebner (1922, 29). A comparison of all the methods of boiling and bleaching which have been investigated shows that the tensile strain and the ripping strain are not directly comparable. The results of both tests, however, provide useful information.

R. G. Fargher and J. C. Withers (1922, 168) have compiled a summary of the literature on the chemical constituents of raw cotton.

The United States Department of Agriculture (1922, 190) consider that a new variety of the upland type of cotton termed Meade cotton is a desirable substitute for Sea Island cotton.

C. E. Collins (1923, 20) has collected data of some physical properties of cotton cellulose.

A further contribution on the constituents of raw cotton has been made by E. Knecht and G. H. Street (1923, 73).

F. T Peirce (1923, 84) has come to the conclusion that the resistance to twist and the forces brought into play by the twisting of cotton hairs, form a direct influence on many important properties of yarn. The resistance may be expressed by the couple or twisting force due to one turn per centimeter, a quantity which he has termed the "rigidity of the hair."

The effect of metallic salts, etc., upon the tensile and ripping strains of cotton has been investigated by J. Huebner and V. Malwin (1923, 120). They have shown that the reduction in ripping strain brought about by certain salts, either in the air-dry condition or when dried for two hours at 100 deg. Cent., is not due to chemical action.

R. G. Fargher and M. E. Probert (1923, 120) have examined the constituents of the benzene extract of American cotton. They have found that of the substances present those in largest amounts are α-gossypyl alcohol, carnaubic acid, liquid hydrocarbons, montanyl alcohol and β-gossypyl alcohol.

The regularity or evenness of a selection of yarns varying in counts from 7's to 200's has been recorded photographically by A. E. Oxley (1923, 175).

In order to facilitate the spinning operation as well as the preparatory operations leading up to spinning, E. Knecht (1923, 183) has patented a method, the chief object of which is to soften the impurities contained in the fiber.

A detailed account of the cotton hair wall is given, as a result of microscopic study, by H. J. Denham (1923, 219).

A comparative study of the volatile products derived from cotton by the action of water and sodium hydroxide has been made by P. H. Clifford and R. G. Fargher 1923, 221).

A method of preparing a standard cellulose and methods of analyses of the celluloses have been prepared by the Committee of the Division of Cellulose Chemistry to the American Chemical Society (1923, 302).

A summary of the literature relating to the swelling of cotton cellulose in water, in solutions of acids, alkalies, etc., has been compiled by G. E. Collins (1923, 303).

The swelling of cotton hairs in sodium hydroxide has been studied by G. E. Collins and A. M. Williams (1923, 368). As has been shown in previous work, maximum swelling is produced when caustic soda of about 30 deg. to 40 deg. Tw. has been employed.

A summary of the literature on the action of light on dyed cotton has been compiled by P. W. Cunliffe (1923, 371).

G. G. Clegg and S. C. Harland (1924, 55) have measured the mean area of a cross section of single cotton hairs as well as the mean hair weight per centimeter of length.

The plasticity cotton, wool, silk, mercerized cotton and artificial silks has been studied by F. T. Pierce (1924, 57).

Some observations of sorption have been made by H. F. Coward, L. Spencer and F. C. Wood (1924, 90). The authors are of opinion that there is no difficulty in ascribing to chemical action every case of preferential absorption of cotton.

H. F. Coward, F. C. Wood and F. L. Barrett (1924, 90) have examined the tendering of cotton fabric by acids. They state that the values of the viscosities of cotton solutions in ammoniacal cupric oxide are much more sensitive indications of changes produced than are the tensile strain values.

The action of highly concentrated hydrochloric acid on cellulose and on some derivatives of glucose and xylose has been studied by E. L. Hirst and D. R. Morrison (1924, 91).

R. Haller (1924, 91) has investigated the action of water, alkalies and salts on raw cotton fibers under pressure. He concludes that for ordinary bleaching the best results are obtained by boiling in caustic soda of 4 to 5 deg. Tw., while for full bleaching, lime and alkali combined are better suited.

M. Calvert and S. C. Harland (1924, 119) state that the cotton hair may be restored approximately to its original conformation, i. e., the appearance it exhibited before it collapsed, by treatment with sodium hydroxide of 40 deg. Tw., after which its external diameter can be accurately measured.

A. E. Oxley (1924, 135) has studied the luster of doubled cotton yarns. The paper contains photographs of doubled yarns, the doubling of which had been varied from the normal doubling twist.

A. R. Urquhart and A. M. Williams (1924, 187) have found that raw cotton dried at 110 deg. Cent. suffers a greater loss in weight than does cotton which is dried at 15 deg. Cent.

J. O. Small (1924, 187) considers that, from a practical point of view, the viscosity of cotton cellulose is its most important physical property.

Comparative experiments on the action of potassium, magnesium and barium permanganates in neutral solution on purified cotton cellulose have been carried out by H. Hibbert and L. L. Parson (1924, 187).

A photometric method of measuring the luster of lint cotton has been described by A. Adderley (1924, 238). He concludes that cotton hairs which tend to be circular in section have a higher luster than hairs with flattened sections.

A modified single thread tester has been employed by B. D. Vincent (1924, 239), in order to determine the tendering effect of sulphuric acid on single cotton hairs and yarns.

S. R. Trotman and R. W. Sutton (1924, 304) have studied the influence of micro-organisms on wool and cotton. The paper is illustrated with photomicrographs.

P. H. Clifford and M. E. Probert (1924, 383) have extracted Mississippi Delta cotton with chloroform. They have found that the results of the examination of the cotton waxes confirm those obtained by Fargher and Probert.

Flax and Other Bast Fibers

The waxes of linen and cotton fibers and their behavior in the bleaching process have been studied by S. H. Higgins (1914, 330). It was found that throughout the whole of the experiments cotton and linen show similarity of behavior.

The same author (1914, 331) has shown that the reduction in strength in cream and tinted linen on bleaching is due to the formation of oxycellullose and that it depends upon the method for cream tinting.

J. F. Briggs (1916, 78) has investigated damages due to both chemical and mechanical causes in the bleaching of linen and cotton.

C. G. Schwalbe and E. Becker (1919, 200) have studied the chemical composition of flax and hemp sprits, with regard to the utilization of this waste.

An articlle on the bleaching of yarn made from flax, jute and hemp has been contributed by E. Clayton (1923, 31).

C. R. Nodder (1923, 119) has shown that although flax and cotton fibers are not homologous they show a great similarity in structure. Both fibers show minute pores in the cell walls.

S. G. Schimansky and P. P. Budnokoff (1923, 184) describe a method for the cottonization of flax which consists in splitting up the flax fibers into simpler fibers of a length similar to cotton. The cottonizing agent consists of a mixture of caustic soda and sodium bisulphite.

R. O. Herzog (1924, 19) has reported upon the cottonization of hemp. He states that cottonized hemp mixed with an equal quantity of cotton can be spun into 20's yarn.

B. Loomis (1915, 226) has patented a process for retting and degumming of fiber plants.

A process in which the gum and resin present in flax and straw are removed by a preliminary treatment with "Magadi soda" has been patented by L. A. Johnson (1921, 22).

A suitable steeping process prior to the retting of flax under high pressure without the addition of chemicals is suggested by G. Ruschmann (1923, 219).

W. Muller (1923, 283) has examined specimens of flax retted in different localities in order to determine the completion of the retting process.

The duration and the acceleration of flax retting has been investigated by F. Tobler (1924, 19).

E. Kayser (1924, 121) has patented a process for retting flax, hemp, etc., in which a special culture of microbe is used.

J. V. Eyre and C. R. Nodder (1924, 237) have conducted an experimental study of flax retting. It deals chiefly with the development of acidity during the retting of flax, its interpretation and technical significance.

As regards the function of water in the wet spinning of flax, W. H. Gibson (1924, 383) has shown that in both dew and water-retted flaxes the ideal aim is to obtain the maximum absorption of water by the pectin compounds, consistent with negligible loss of these compounds through solution in the water of the spinning trough.

O. Richter and F. Pick (1915, 266) have patented a process of obtaining fibers from China grass in which lævulose is obtained as a by-product.

Mechanical means employed in the treatment of ramie, flax, etc., have been patented by E. P. Govaerts and G. A. M. Dyrepondt (1920, 243).

R. Weiss (1921, 121) has suggested a process for degumming ramie in which the fiber is treated with olein soap solution, cocoanut oil and olive oil, and finally with caustic soad.

A series of experiments has been carried out by P. Krais (1919, 157; 1919,231; 1920, 85; 1920, 243) with nettles by steeping the stems in sodium bicarbonate solution, which, it is stated, produces an effective retting.

H. Reimers (1923, 219) divides the bast fibers into three groups according to their microscopic appearance, i. e., (a) hemp, (b) nettle, and (c) flax.

The production of pure nettle fiber is discussed by A. Herzfeld (1916, 265).

The formation of a company in Berlin for the manufacture of nettle fiber is announced (1917, 42), and O Richter and F. Piek have patented the removal of the nettle bark by maceration in ammonia solution (1917, 43).

The production of fiber for spinning from nettles, by treating the plants with a mixture of hydrochloric and sulphuric acid, has been patented by H. Wagner (1917, 259).

A statement that the area in which nettles will be cultivated in Germany in 1918 is estimated at 56,800 acres, which are expected to yield about 170,000 cwt. of fiber,

conveys some idea of the extent to which this fiber is employed in that country (1918, 79).

C. Sunder (1923, 219) describes the treatment of the stem of the nettle in order to obtain a pure fiber. He draws attention to the low yield obtained.

E. A. Ironside (1924, 121) has found that jute is softened by heating in water containing an unmiscible mineral oil.

New Fibrous Materials

R. Werner (1914, 300) describes a new bast fiber, "Solidonia," which is employed in mixtures with wool or cotton. Dyeing properties of the fiber are fully discussed.

W. Massot (1916, 265) states that two new textile fibers, "Solidonia" and "Cellonia," have been in the German market for some time. They are used as wool substitutes. A microscopic examination shows that they are similar to German and Chinese nettle fiber.

H. W. Adams (1921, 88), the representative of the American Department of Commerce in Germany, draws attention to the results obtained in Germany in the manufacture of yarn from grass, plants, leaves, etc. He mentions particularly "Solidonia," the fiber derived from China grass, and "Posidonia," the fiber derived from Australian seaweed, as particularly suitable for the manufacture of carpets.

J. C. Earl (1924, 92) hydrolized the air-dry "Posidonia" fiber with sulphuric acid. He found that the cellulose in the acid-treated fiber amounted to 33.2 per cent on the original dry fiber.

In a further communication (1924, 299), data are given enabling the cellulose from this fiber to be compared with cotton cellulose. The author concludes that "Posidonia" cellulose is of the polyanhydro-glucose type, like cotton.

A paper read before the Manchester Section of this society (1916, 274) by C. F. Cross and E. J. Bevan, contains valuable information and excellent photomicrographs of the seed hair of the *Eeriodendron anfractuosum*, the true Kapok fiber, generally known as "silk cotton."

The consumption of Kapok fiber in the United States in 1917 amounted to 8,472,830 pounds, but no mention is made of its use in the textile industries.

The Manchester Guardian, of October 19, 1922 (1922, 305), published an article on Arghan, the product of a plant akin to the pineapple, for which high claims are made as a rival to cotton, flax and hemp. It is stated that spinning experiments have reduced one pound of the fiber to a length of 3,500 yards.

G. A. Lowry (1923, 52) states that attention was drawn to Arghan by E. G. Squires as long ago as 1860-61.

W. Muller (1923, 283) gives a comparison of the mean diameter and the average length of the Arghan fiber and the flax and the hemp fiber. He found that the lumen is fairly constant in size and that it amounts to about one-third of the cross section of the fiber. Constrictions similar to those in jute were noticeable.

M. Becke (1924, 20) states that the cultivation of Arghan has been commenced in the Malay Peninsula. The individual fiber cannot be spun successfully, but the fiber bundles which are from 6 to 9 feet in length should be a useful substitute for flax, hemp and manila.

The Water Hyacinth (1915, 85), which grows abundantly in Indo-China, is supposed to give a coarse fibrous material for the manufacture of sail cloth.

J. C. M. van Diggelen (1916, 117) states that grass or straw, when treated with caustic soda containing copper sulphate and a very small amount of ammonium chloride, yields fibers which are capable of being spun and woven.

The manufacture of textile fibers from rice straw is claimed by V. Volpato (1918, 103).

The production of knitted hemp substitutes which consist of threads spun from silk, cotton, ramie, jute, wool or paper, treated with a colloid, is the subject of a patent by Fibern Manufactur Act.-Ges. (1916, 284).

According to A. C. Voumasos (1917, 121) it has been found that the tow or fibers of the *Hibiscus cannabinus* yield almost perfectly pure cellulose which can be employed in the manufacture of various cellulose products.

It is announced that the fiber obtained from the butt end of the rushes which abound in East and West Prussia, Poland, Austria-Hungary and the Balkans, may be used as a textile substitute and that a company has been formed in Germany to take up the manufacture (1917, 217).

E. K. Zeise-Gott and R. Sutterlin (1917, 217) suggest the manufacture of a textile fiber from broom, while T. Schiefner (1917, 217) states that fine yarns can be spun from osier bark.

A company, known as Pflanzenfaser Pat. Gessel., Berlin, has been formed for the production of textile fibers from lupin plants (1918, 192).

The production of a wool substitute from the *Eriophorum* fiber has been patented by E. L. Fegraeus (1918, 192), while P. Krais (1918, 192) claims the production of another wool substitute by employing ground wool, hair, horn or scrap leather.

The production of a fibrous material from the fresh leaves of the cocoanut palm which may be used in the production of woven fabrics is claimed by K. Miyake (1918, 251).

It is stated that the problem of the utilization of the so-called "staple fiber," the name which is applied in Germany to artificial silk produced in the form of short fine hairs, is being investigated by the German War Raw Materials Department (1918, 232).

A further discussion on the use of "staple fiber," particularly in conjunction with other fibers, such as cotton and wool, appears in The Times' Trade Supp. of May 31, 1919 (1919, 183), and a further reference to this fiber is made in the Konfectioner, No. 34, 1919 (1919, 231).

A process for producing textile fibers from grass, reed rushes, straw, etc., has been patented by A. F. W. Brummer (1919, 231).

The Commerce Reports of America draw attention to a plant, the *Anhimga*, which is supposed to yield a fiber which resembles high quality cotton (1920, 150).

"Pita" fiber obtained from *Furcroya gigantea*, which is cultivated in Brazil, may be used as a substitute for jute,

(*Continued on page* 198)

Foreign Dyes Imported Through the Port of New York During February

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.

B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.

By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.

C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.

K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.

M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg, near Leipzig. Founded 1882.

CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.

CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823

GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.

L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879

tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.

WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.

G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.

I—Gesellschaft fur chemische Industrie. Founded 1885.

S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887.

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888

NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.

CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)

P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.

BAC—British Alizarine Co., Ltd., Manchester

BD—British Dyestuffs Corporation, Ltd., London.

Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.

CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.

Hol—L. B. Holliday & Co., Ltd., Huddersfield.

Scot—Scottish Dyes, Ltd., Grangemouth.

THE imports of coal-tar dyes for the month of February, 1925, totaled 373,259 pounds, with an invoice value of $365,268. The imports of dyes by ports are as follows:

	Pounds	Invoice Value
New York	354,427	$346,859
Boston	15,142	13,699
Providence	3,586	4,398
Detroit	100	260
Philadelphia	4	52

Dyes Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
August 31, 1924	507,338	1,081,287
September 30, 1924	559,661	1,111,656
October 31, 1924	552,556	1,050,037
November 30, 1924	533,760	1,031,460
December 31, 1924	575,051	1,086,108
January 31, 1925	571,371	952,202

Five Leading Dyes by Quantity Imported in February

Indanthrene Blue GCD	16,006 pounds
Algol Brown R	15,669 pounds
Indanthrene Green G, GG	11,992 pounds
Indanthrene Black BB	10,061 pounds
Indanthrene Yellow G	9,844 pounds

Per Cent by Country of Shipment

Germany	54	Canada	3
Switzerland	27	Belgium	3
Italy	6	France	1
England	5	Holland	1

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

The designation of "†" for competitive and "*" for non-competitive indicates the appraisement basis for the assessment of the ad valorem duty in paragraph 28 of the Tariff Act of 1922. Those dyes without designation were doubtful at the time of the collection of the statistical information in this report.

The ad valorem rate for competitive dyes is based on the American selling price as defined in subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

DYES OF COAL-TAR ORIGIN*

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
2	Fast Printing Green—(By)	500
11	†Chlorazol Fast Orange D—(BD)	500
19	Fast Light Yellow 2G—(By) Fast Light Yellow 3G—(By) Kiton Fast Yellow 3G—(I)	2,088
58	Ultra Orange R—(S)	500
88	*Acid Anthracene Brown PG—(By)	375
94	Guinea Fast Red 2R—(A)	500
133	Eriochrome Phosphine RR—(G)	108
140	*Chromocitronine R—(DH)	440
144	Orange S—(B)	55
175	Acid Ponceau E—(G)	330
177	Milling Yellow O—(C)	200
182	Brilliant Sulphon Red B, 10B—(S)	1,623
207	Diphenyl Fast Brown GNC—(G)	4,410
211	Resorcin Brown—(A)	50
264	Fast Sulphon Black F—(S)	100
265	Acid Milling Black B—(G)	4,409
273	*Blue NA—(C)	2,000
284	Vesuvine BLX—(B)	200
296	†Benzo Fast Yellow RL—(By)	344
306	*Ignamine Orange 3G—(B)	750
313	Congo Rubine B—(K)	300
315	Congo Orange G—(By)	6
319	Diamine Scarlet 3B—(C)	1,000
358	*Chloramine Red 8BS—(By) Toluylene Red Powder—(Gr-E)	717
364	*Diazo Brilliant Black B—(By)	441
373	*Congo Orange R—(A)	300
400	Acid Anthracene Red 3B—(By) Acid Milling Red R Conc.—(G) Milling Scarlet 4R Conc.—(M)	521
448	Diamine Bronze G—(C)	100
449	†Trisulphon Brown B Conc.—(S)	6,789
496	Setoglaucine Conc.—(G)	106
501	*Acronol Brilliant Blue—(BD)	100
503	Brilliant Milling Green B—(C) Erioviridine B Supra—(G) Guinea Fast Green B—(A) Patent Green AGL—(M)	851
506	Erioglaucine X Highly Conc.—(G)	1,323
507	Xylene Blue VS Conc.—(S)	3,002
516	†Crystal Violet Extra—(B) †Crystal Violet P—(By)	400
530	Acid Violet 6B—(tM)	1,000
535	Alkali Blue D—(A)	10
537	Methyl Lyons Blue—(G)	7,165
543	†Brilliant Acid Blue V—(By)	300
545	†Acidol Blue—(tM) Brilliant Acid Blue A—(By) Brilliant Acid Blue FF—(By) Poseidon Blue BR Extra—(B)	2,085
546	Blue Extra—(C)	500
549	Brilliant Chrome Violet 4B—(DH)	110
551	Chromoxane Briliant Blue G—(By) Eriochrome Azurol BC, BX—(G)	2,746
562	Brilliant Wool Blue FFR Extra—(By)	441
565	Wool Blue 5B—(A)	1,500
571	Rhodamine 6GDN Extra (s.s.)—(B)	7,275
573	Rhodamine B Conc. (s.s.)—(G) Rhodamine B Extra (s.s.)—(B) Rhodamine B Extra (s.s.)—(M)	7,755
603	Acridine Orange DHE—(DH) *Brilliant Acridine Orange A—(DH)	882
607	Runic AL Conc.—(B)	500
608	Patent Phosphine GRNTN—(B)	680
609	Flavophosphine G Conc.—(M)	100
617	Diphenyl Chlorine Yellow FF—(G)	662
618	Basic Yellow T—(C) Basic Yellow TCN—(C) Setoflavine T—(G)	3,609
627	Chromacetine Blue S Extra—(DH)	441
635	*Gallo Violet DF Powder—(By) Modern Violet—(DH)	320
645	Gallazine Powder—(DH)	220
649	Cotton Blue R Extra Conc.—(B)	220
659	Methylene Blue BGX—(B)	200
673	Azo Carmine BX—(B) Rosinduline 2B Bluish—(K)	1,100
681	Direct Gray R Paste—(G)	1,433
681	Malta Gray J—(P)	441
699	Induline NN—(B)	50
759	Anthra Yellow GC Paste—(B) Anthra Yellow GC Powder (s.s.)—(B) *Anthraflavone GC Paste—(B) Vat Yellow GC Paste—(B)	6,449
760	Helindone Golden Orange IG Pdr. (s.s.) (M) Vat Golden Orange G Pdr. (s.s.)—(B)	1,440
761	Vat Orange RRT Paste—(B)	7,645
765	Helindone Blue Green IB Double Paste (s.s.)—(M) Vat Black BB Dbl. Pst. (s.s.)—(B)	

*This table includes imports through the port of New York to the amount of 354,427 pounds, and also 1,542 pounds through the port of Boston, 3,586 pounds through the port of Providence, 100 pounds through the port of Detroit and 4 pounds through the port of Philadelphia.

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
	Vat Black BB Powder (s.s.)—(B).....	10,061
767	Vat Brilliant Violet RR Paste—(B)	
	Vat Brilliant Violet Powder (s.s.)—(B)	
	Vat Violet RR Extra Powder (s.s.)—(B)	3,744
778	†Alizarine VI Extra Pure—(B)	
	Alizarine Red IB Extra Paste—(By)	
	Alizarine Red DIB Paste—(M).....	7,573
779	*Alizarine Orange Paste—(BD)	
	Alizarine Orange A Paste—(B)	500
780	†Alizarine Red S Powder—(BD).....	500
783	Purpurine—(By)	1,332
784	†Alizarine SX Paste—(B)	2,180
785	Alizarine Red YCA Paste—(BAC).....	2,272
792	Cibanone Orange R Powder (s.s.)—(I).	1,232
795	Cibanone Yellow R Paste—(I).....	2,204
799	Alizarine Cyanine 2G Powder—(By)...	1,552
804	*Alizarine Blue S Powder—(By).....	200
810	Helindone Yellow 3GN Paste—(M).....	500
817	Vat Yellow GK Paste—(By).....	604
821	*Vat Brilliant Violet BBK Paste—(By)..	397
825	Vat Red BT Powder—(Gr-E).....	110
827	*Anthra Bordeaux R Paste—(B).....	1,261
830	Anthra Red RT Paste—(B)	
	Anthra Red RT Paste—(M).....	2,948
831	*Duranthrene Red BN Paste—(BD)	
	Vat Red BN Extra Paste—(B)	
	Vat Red BN Extra Powder (s.s.)—(B)	
	Vat Red RK Paste—(B)	
	Vat Red RK Powder (s.s.)—(B).....	9,256
832	Helindone Violet IBN Paste—(M)	
	*Vat Violet BN Paste—(B)	
	Vat Violet BN Extra Paste—(B)	
	*Vat Violet BN Powder (s.s.)—(B).....	3,109
833	Helindone Olive IR Paste—(M)	
	Vat Olive R Paste—(By)	
	Vat Olive R Powder (s.s.)—(B).....	3,278
838	Indan. Blue RS Tr. Pdr. (s.s.)—(B)....	1,200
840	†Vat Blue 3G Paste—(B).....	1,240
842	Helindone Blue IGCD Dbl. Pst. (s.s.)—(M)	
	Indan. Blue GCD Dbl. Pst. (s.s.)—(B)	
	Vat Blue GCD Dbl. Pst. (s.s.)—(B)....	16,006
849	Indan. Yellow G Paste—(B)	
	Indan. Yellow G Dbl. Pst.—(B)	
	Vat Yellow G Dbl. Pst.—(B)	
	Vat Yellow G Dbl. Pst. Fine—(B).....	9,844
851	Alizarine Leveling Blue B—(C).....	1,000
852	Alizarine Blue JR—(By).....	79
853	*Anthraquinone Violet Powder—(B)....	100
854	*Alizarine Viridine FF Powder—(By)....	396
858	Alizarine Light Blue B—(S)	
	†Alizarine Light Blue B Conc.—(S)	
	Alizarine Sapphire Blue B—(I).....	3,157
860	Alizarine Direct Blue BGAOO—(B)...	294
862	Alizarine Blue Black 3B Powder—(M).	1,000
863	Anthraquinone Blue Green BXO—(B)..	100
867	†Anthra Brown B Dbl. Past. (s.s.)—(B)	708
869	Helindone Brown IR Paste—(M)	
	Helindone Brown IR Powder (s.s.)—(M)	
	Vat Brown R Paste—(B)	
	Vat Brown R Powder (s.s.)—(By).....	15,669
871	Vat Red Violet RRK Powder (s.s.)—(B)	800
874	*Indigo—(Q)	1,040
876	Indigosol O4B Powder—(B)	
	Indigosol O4B—(DH)	210
881	Brilliant Indigo 4B Paste—(B)	
	Brilliant ndigo 4B Powder (s.s.)—(B)..	5,659
894	Alizarine Indigo Green B Paste—(By)..	419
901	Ciba Violet B Powder (s.s.)—(I)	
	Ciba Violet R Paste—(I).....	8,812
904	Helindone Brown G Powder (s.s.)—(M)	1,400
907	Ciba Scarlet G Extra Paste—(I)	
	Ciba Scarlet G Ex. Pdr. (s.s.)—(I)	
	Thioindigo Scarlet 2G Paste—(K).....	7,238
908	Ciba Red R Paste—(I).....	2,204
910	Helindone Pink AN Paste—(M).....	628
911	Ciba Orange G Paste—(I).....	1,102
912	Vat Red R Powder (s.s.)—(B).....	788
913	Hydron Orange RF Paste—(C)	
	Vat Orange RF Paste—(B).....	2,999
918	Thioindigo Red 3B Paste—(K)	
	Vat Red 3B Powder (s.s.)—(B).....	2,874
920	Helindone Violet R Paste—(M).....	479
923	Fur Black DB—(A)	
	Fur Blue Black B—(A)	
	Fur Gray ALA—(A)	
	Furrol Yellow Brown G—(C).....	650

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Milling Yellow G Conc.—(S).....	568
Acid Pure Blue R Supra—(G).....	2,204
*Acid Rhodamine BG—(B).....	250
*Acid Rhodamine 3R—(I).....	220
Alizarine Blue G—(BC Ltd.).....	42
Alizarine Leveling Blue CA—(C).....	100
Alkaline Fast Green 3G—(M).....	500
Brilliant Milling Blue B—(C).....	1,200
Brilliant Milling Violet R—(DH).....	220
Erio Fast Yellow R Conc.—(G).....	110
Guinea Light Blue A—(A).....	5
Leveling Silk Blue B—(C).....	500
Polar Orange R Conc.—(G).....	1,102
Polar Red G Conc.—(G).....	2,205
Radio Brown B—(C).....	50
*Sulphon Orange G—(By).....	300
Supramine Yellow G—(By).....	441
*Supramine Yellow R—(By).....	200
Wool Fast Blue BL—(B).....	200
Wool Fast Blue GL—(By).....	437
Wool Fast Violet B—(By).....	10

Name of Dye and Manufacturer	Quantity (pounds)
Xylene Fast Blue GL Conc.—(S)	200
*Xylene Milling Blue AE Conc.—(S)	1,000

Vat Dyes

Algol Pink FF Paste—(By)	1,683
Algol Pink R Powder (s.s.)—(By)	20
*Alizarine Indigo Brown R Paste—(By)	8,820
Ciba Red 3B Paste—(I)	198
Ciba Red 3B Powder—(I)	55
Cibanone Orange 3R Powder—(I)	441
Cibanone Orange 6R Powder—(I)	331
*Duranol Blue G Paste—(BD)	477
*Duranol Orange G Paste—(BD)	60
*Duranol Red 2B Paste—(BD)	60
*Duranol Red G Paste—(BD)	180
Eridan Scarlet R Paste—(K)	50
Helindone Pink B Extra Paste—(M)	1,000
Helindone Pink R Extra Paste—(M)	1,500
Helindone Printing Black RD Paste—(M)	2,500
Helindone Yellow CG in grains—(M)	10
*Hydron Brown G Paste—(C)	
Hydron Brown R Paste—(C)	6,262
Hydron Pink FB, FF Pastes—(C)	2,400
Hydron Scarlet 2B Paste—(C)	
Hydron Scarlet 3B Paste—(C)	3,939
*Hydron Sky Blue FK Paste—(C)	1,000
Hydron Violet R Powder—(C)	1,000
Hydron Yellow GG Paste—(C)	250
Indanthrene Blue BCD (s.s.)—(B)	2,936
†Indanthrene Blue BCS Powder (s.s.)—(B)	2,500
Indanthrene Brilliant Blue R Paste—(B)	700
Indanthrene Brilliant Violet RRP Pdr.—(B)	662
Helindone Brown IG Paste—(M)	
Helindone Brown IG Powder—(s.s.)—(M)	
Vat Brown G Powder (s.s.)—(B)	5,369
Helindone Brown IGG Paste—(M)	
Helindone Brown IGG Powder—(M)	1,300
Helindone Golden Orange I 3G Paste—(M)	
*Vat Golden Orange 3G Paste—(By)	
*Vat Golden Orange 3G Powder (s.s.)—(By)	1,874
Vat Green G Double Paste (s.s.)—(B)	
Vat Green GG Double Paste (s.s.)—(B)	11,992
Anthra Pink B Extra Powder (s.s.)—(B)	
†Anthra Pink R Extra Paste—(B)	
Vat Pink B Double Paste (s.s.)—(B)	6,945
Anthra Violet BB Paste—(B)	100
Vat Red 2G Paste—(B)	494
Samples of vat dyes—(By)	182

Mordant and Chrome Dyes

Alizarine Blue WS—(By)	220
Alizarine Fast Gray 2BL Powder—(By)	617
Alizarine Light Gray BS Conc.—(S)	500
Anthracene Chromate Brown EB—(C)	500
Brilliant Chrome Blue 2B—(DH)	110
*Chromazurine G Powder—(DH)	220
Chromazone Red New Conc.—(G)	213
Chrome Brilliant Blue G—(G)	150
*Chrome Fast Phosphine R—(DH)	110
*Chromocitronine 3R—(DH)	110
Chromovesuvine JA, RA—(DH)	220
Eriochrome Green L—(G)	331
Eriochrome Red G—(G)	441
Eriochrome Violet 3B—(G)	298
Metachrome Blue Black 2BX—(A)	1,500
Metachrome Brilliant Blue BL—(A)	200
Metachrome Brilliant Blue 8RL—(A)	300
Metachrome Olive Brown G Powder—(Bro.)	1,000
Metachrome Red G—(A)	400

Direct Dyes

*Artificial Silk Black R—(By)	99
Azonine Direct Blue B Paste—(C)	1,000
Azonine Direct Yellow RR Paste—(C)	500
*Benzo Fast Brown 3GL, RL—(By)	670
Benzo Fast Eosine BL—(By)	99
Benzo New Blue G—(By)	6
Benzo Rhoduline Red 3B—(By)	200
Brilliant Benzo Violet 2R—(By)	319
Brilliant Congo Violet R—(A)	200
Brilliant Sky Blue 8G Extra—(B)	802
Chicago Red III—(G)	1,102
Chlorantine Fast Blue 2GL—(I)	2,535
Chlorantine Fast Blue 8GL—(I)	110
Chlorantine Fast Brown RL—(I)	4,409
Chlorantine Fast Green B—(I)	1,102
Chlorantine Fast Violet RL—(I)	194
Chlorantine Fast Violet 5BL—(I)	1,102
Chlorantine Fast Violet 4BLN—(I)	220
Chlorantine Fast Red 3B—(I)	220
*Chlorazol Fast Brown RK—(BD)	500
Columbia Catechine AG—(A)	55
Cupranil Brown R—(I)	1,100
Developed Green 3G—(B)	110
Diamine Azo Brown G, 2G—(C)	661
Diamine Azo Fast Green G—(C)	1,654
Diamine Azo Fast Violet R, 3R—(C)	551
Diamine Azo Orange RR—(C)	220
Diamine Azo Violet BL—(C)	476
Diamine Fast Blue F—(C)	500
Diamine Fast Rubine FB—(C)	200
Diaminogene GG—(C)	882
Dianil Crimson B—(M)	250
Diazamine Blue 4R Conc.—(S)	500
*Diazanil Pink B—(M)	468
Diazo Brilliant Green 3G—(By)	2,205
Diazo Brilliant Orange GR Ex.—(By)	399
Diazo Brilliant Scarlet 2BL Ex.—(By)	165
Diazo Brilliant Scarlet 6B Ex.—(By)	437
Diazo Brilliant Scarlet 5BL Ex.—(By)	110
Diazo Brown 3G Powder—(By)	795
*Diazo Brown 6G—(By)	463
Diazo Fast Green GF—(By)	200
Diazo Fast Violet 3RL—(By)	200

Name of Dye and Manufacturer	Quantity (pounds)
Diazo Fast Yellow 2G—(By)	1,574
*Diazo Sky Blue 3GL—(By)	166
Diazophenyl Black V—(G)	1,102
Diphenyl Fast Bronze B—(G)	2,205
Diphenyl Fast Gray B Conc.—(G)	83
Direct Orange R—(I)	101
Fast Cotton Brown 4RL—(A)	200
Fast Cotton Rose 2B—(A)	25
Fast Cotton Violet 4R—(A)	100
Naphthamine Light Orange L—(K)	100
Naphthamine Light Violet 2B—(K)	300
Sulphur Dyes	
*Cross-Dye Green B—(BD)	7,429
*Cross-Dye Green 2G Conc.—(BD)	4,736
Pyrogene Brilliant Blue 6B—(I)	220
*Thional Brilliant Blue 6BS Conc.—(S)	1,074
Sulphur Yellow G Extra—(A)	500
Basic Dyes	
Blue Base I—(I)	11
Straw Blue G—(By)	95
Spirit-Soluble and Color-Lake Dyes	
Cores Blue I—(By)	11
Helio Bordeaux BL Paste—(By)	842
*Helio Marine RL Powder—(By)	143
Japan Black Extra—(B)	200
Oil Red G—(BC Ltd.)	124
Permanent Red F6R Extra—(A)	5
Stone Fast Yellow GN Lumps—(B)	200
Stone Fast Yellow GR Paste—(B)	200
Stone Fast Yellow GR Lumps—(B)	100

MARCH MEETING OF THE S. O. C. M. A.

The regular monthly luncheon-meeting of the Dyestuffs Section of the Synthetic Organic Chemical Manufacturers Association of the United States was held at the Hotel Commodore, New York City, at 12.30 p. m. on Thursday, March 12.

An invitation was extended to all the members of the section to attend the dinner of the Salesmen's Association of the Chemical Industry on Tuesday, March 31, to hear General Fries on "The Relation of the Chemical Warfare Service to the Chemical Industry and of the Industry to the Service."

Chairman Merz stated that in having occasion to use the Tariff Commission's census of 1923 recently he had been struck with the amount of information therein with which he was not familiar. He thereupon pointed out some interesting facts picked more or less at random from the tables contained in the census, and urged each member to give detailed study to this booklet.

President Herty urged the members to file their information for the 1924 census with the Tariff Commission as promptly as possible.

Attention was called to the statements in Senate Document No. 198, a report on the calf-leather industry submitted by the Department of Commerce to the Senate in response to a resolution requesting the same, regarding the quantity, variety and prices of dyes used in the calf-tanning industry.

Following general discussion of the probability of tariff revision, the meeting adjourned at 2.30 p. m.

SPRING MEETING OF A. C. S.

The program for the spring meeting of the American Chemical Society, to be held in Baltimore during the week of April 6th, embraces many fields of chemical activity. The sessions of the division of Industrial and Engineering Chemistry will be devoted largely to a symposium on corrosion. The program for this division consists of two parts. At the first session, scheduled for Tuesday, April 7th, the following papers will be presented: "The Future of Industrial Synthetic Organic Chemicals in the United States," by Dr. Charles H. Herty; "Chemistry and the Leather Industry," by Dr. Allen Rogers; "A Quarter of a Century in Rubber," by William C. Geer, and a paper dealing with tetra-ethyl lead by Thomas Midgely, Jr. The second part of the program planned for this division will embrace the papers on corrosion, presented from many angles by prominent technical men. The Petroleum Section, the Gas and Fuel Section, the Division of Physical and Inorganic Chemistry, the Division of Medicinal Chemistry and the Division of Chemical Education will each hold special sessions during the spring meeting. Other events and meetings of general interest have been planned as features of the week.

NEW DU PONT VAT BLUE

The Dyestuffs Department of E. I. du Pont de Nemours & Co. announces the development of a new vat blue which is known as Ponsol Brilliant Blue R Paste.

This dyestuff, developed since the war by a European manufacturer, has not heretofore been produced by an American company.

This offering adds one more member to the series of these colors which the Du Pont Company has been developing. It is stated that the new vat blue is similar to Ponsol Blue RS Paste and somewhat redder and brighter. Being the brightest vat blue of reddish cast on the market it can be used for all purposes where Ponsol Blue RS Paste has been employed. It has the further advantage of being considerably faster to chlorine.

It will be used chiefly on cotton, though it is also suitable for dyeing artificial silk and may be applied on pure silk by the bicarbonate method.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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PLAIN TALK ON COMPETITION

PERSISTENT reports to the effect that the German Cartel is effecting a complete reorganization of both its manufacturing and sales units, with a view to the elimination of all duplication of effort, undoubtedly have foundation in fact. Whether or not it will eventually be found possible, or even desirable, for them to maintain a single sales organization in America remains for the future to show. One thing is obvious, however: the Germans are preparing to make a most intensive effort to redeem lost ground in the American market.

What are American manufacturers going to do about it? More important still, what are American manufacturers going to do about the destructive competitive conditions now existing among themselves?

There is no easy answer to either of these questions. As to the first; we doubt if even the Germans, after their efficient reorganization and backed by all their admitted technical and manufacturing skill, can transport to America, pay existing duties and sell *profitably* in this market in competition with the products of American manufacturers at the price levels to which these same manufacturers have depressed their own products.

To our way of thinking, the second problem mentioned above is by far the more important and serious of the two. Why worry about potential German competition when our own manufacturers have so set the stage as to insure almost certain disaster for many of their number?

It is quite true that we have an anti-trust act, and that "combinations in restraint of trade" are frowned upon by our government. To our way of thinking, however, it would be quite possible for many of the American dyestuff concerns to combine their manufacturing and sales efforts in a manner which would not be contrary to law but which would place the resulting merged companies in a position to manufacture and sell on a basis of greatly increased efficiency and consequent lower cost.

Such a course would not only have the obvious advantage of placing the American industry in a position to meet on more nearly even terms the threat of foreign competition, but it would also undoubtedly minimize the ruinous competition now existing between domestic producers. Prices in an industry wherein there were three or four large factors could be much more easily stabilized than in one where there are fifty or more independent competitors.

The history of every large manufacturing industry in the United States, and of organizations engaged in transportation and means of communication as well, shows that they turn unerringly to co-operation and merger in place of indiscriminate competition as a means to survival.

It is true that there are seemingly insurmountable obstacles to be overcome in each individual case. In considering any possible merger, each manufacturer will naturally strive to retain for himself all the business which he now has. Such a spirit will, of course, be destructive to any possible consolidation. There must be a disposition to give and take, and the weaker factors will unquestionably have to give more than they receive. Unless such a spirit is shortly developed, however, it is our opinion that many of the smaller manufacturers will soon have nothing to give and consequently can receive nothing. Adversity oftentimes makes strange bedfellows—the lion and the lamb have been known to occupy the same shelter in times of stress.

It is possible that we take too serious a view of the situation but, in our opinion, not probable. Of one thing we are certain: If we were a dyestuff manufacturer, the consumption of midnight oil in our office would be extremely heavy during the next few months, while the entire executive personnel of our establishment concentrated every facility at their command in an effort to devise some plan by which wholesome co-operation could be substituted for the destructive competition now rampant in the American dyestuff manufacturing industry.

This subject is one which affects consumers as well as manufacturers of dyestuffs. As was clearly demonstrated during the early days of the war, an American dyestuff manufacturing industry is essential to the welfare of the textile and other consuming industries. Buyers of dyestuffs should consider carefully, therefore, whether they may not be actively co-operating with agencies tending to destroy the insurance afforded by the existence of this industry when they encourage price competition. They may discover too late that in the process of saving a few cents a pound on their purchases they have effectually destroyed their source of supply.

THE RESPONSIBILITY FOR GUARANTEED FASTNESS

COMMENTING on an editorial that recently appeared in The REPORTER concerning the responsibility of guaranteeing fastness, a representative of a well known Southern dyeing organization contends that full responsibility should not be shouldered by either the dye maker or the dyer. His letter, which follows, states his argument very clearly and compactly:

I have noted your article headed "More Anent Fastness Guarantees" in your February 23rd issue.

Why should the dyer have to shoulder the responsibility in guaranteeing the fastness of colors or dyes made by dyestuff manufacturers who sell their colors "without guarantee"?

A direct color has only the fastness of its properties as a direct color and I doubt if you could get a single dyer to guarantee a direct color; yet take the direct color business away from our manufacturers and you take away the bulk business.

A vat color has extreme fastness, yet I doubt if you will find a dyer who will guarantee the fastness of vat colors. He could not afford to. Even some vat colors, the fastest colors we have, are not *absolutely fast*. The dyer may deliver yarns dyed with the so-called vat colors, yet these colored yarns after weaving into goods can be affected by some ingredients used in boiling out the goods or in washing.

If a man buys a pair of guaranteed shoes from a retail store it means that the manufacturer has guaranteed them; the retailer will suffer no loss should the shoes prove defective or faulty as he can depend on the manufacturer. The only way a dyer can supply the trade or his mill with dyed goods is on the basis of submitting a sample of the dyed goods to his customer or mill, who in turn submit it to their trade. If the sample is approved dyeings can be made and delivered which are in accordance with the sample submitted and approved. If this policy is adhered to the converters or buying trade would be supplied with just what they order, and I am confident the use of the fastest colors or so-called vat colors would increase, tremendously benefiting both the buying trade and the dye manufacturers.

The dyer's position is the same as the manufacturer's position as outlined in the article referred to, in that the dyer's responsibility ceases when he supplies his customer dyed goods equal to the samples submitted.

I do not believe the dyestuff manufacturer can afford to guarantee his dyes; neither is it possible for the dyer to guarantee the fastness of colors.

The Grey Hosiery Mills, of Hendersonville, N. C., will erect an addition 50 by 130 feet to be used as a dyehouse and finishing plant.

Highs and Lows in a Busy Chemist's Life—Part I

"NOW," said the treasurer, what we want is a man to go heart, body and soul into this business, and to work days and nights and Sundays to save money."

Also as reflecting a prevalent opinion of some years ago, he remarked, "Dyers are a race of crooks, aren't they B——?" "Yes, sir," said B——, who, coming from the New York sales office, was undoubtedly an authority.

I thought I might as well agree, for it sounded inspiring, and I had to have a job, anyway.

Thus I was introduced to the textile industry, told to begin work as soon as possible after graduation, and that my pay would begin at once, June first. I even began work before school closed, on a sample of softener. This was a pretty, pure white, silky paste, and a report had been made by one of the professors, showing its composition, and now including in it an item of 2 or 3 per cent wool grease. As I recall it now, I discovered only water and stearic acid. I suspect both analyses were more or less wrong. It takes a clever man to identify 2 or 3 per cent of wool grease, and there probably was none there. The composition was most likely an ammonium stearate softener containing enough excess stearic acid to give an acid reaction and prevent any odor of ammonia.

The chemist would sometimes make more of a showing if he was hired before something happened instead of after. It was a pity that the ground caustic containing 10 or 20 per cent salt had already been thrown out before I arrived on the scene. Caustic of that nature was being bought in large amounts and was discovered by a consulting chemist. Anyway, it was one of the things that inspired the founding of the laboratory, and that was some consolation, but I am tolerably sure that I could have discovered it, and might have had the credit.

It is strange how master mechanics or general superintendents will buy some apparatus and then decide that they need somebody else to run it. Some of their selections are positively humorous. That is, they would be if one did not have to use them, for after the stuff is once bought you can't throw it away and buy what you want. They seem to think the heavier the glass, the better it is. I was always thankful when a piece of it got broken, accidentally, of course.

When I remarked that a certain rough balance was hardly accurate enough for the purpose, since it would not weigh to centigrams twice alike, the superintendent said it was supposed to be the most accurate scale there is.

Last, but not least, the table top covered with galvanized sheet iron. Reminds one of the poet's lines:

Mary had a little lamb,
His stomach was lined with zinc,
He swallowed H_2SO_4,
And now he's on the blink.

But we mustn't be facetious, or like "Chemistry and Industry," the editor will be getting letters from those who do not like their 300 per cent concentrated color adulterated with jokes and poetry.

It is pretty good "dope" in taking a new job to follow up the pet ideas of whoever has authority about the place, even if your own are actually a whole lot better. You will get to them in due time, and sooner, if you want to badly enough.

We took up coal analysis, partly because the idea was being more or less aired at the time, and partly because the master mechanic was interested, and so it was an aid to getting needed work done in the new laboratory. Can't say that we ever saved very much actual hard cash through testing coal, but no doubt there was the usual result. We got a little better coal and somebody else a little worse.

Owing both to economic and geographic conditions, there being several separated mills, we did not have any mechanical means of grinding up coal samples. Pounding them to size fell to the lot of the boiler-room helpers, and they would invariably pound too find or too coarse, and try to toss the hardest piece of slate to one side, "No good." But, according to Bailey's rule, we had enough coal so that one piece of slate more or less did not make any difference in the result.

I still think that Bailey's paper in the A. C. S. Industrial Journal of about 1910, on sampling coal must be a masterpiece. If you feel like a little recreation in least squares, or whatever it is, look it up.

Even in this routine work there was some room for originality. Our figures usually came pretty close to outside tests, but like all true scientists we wanted to check up any possible constant error, so we got some U. S. B. S. standard sugar. It was properly put into the bomb, but refused to fire. On opening it was found to have melted onto the wire but not to have ignited.

After due pondering, a little powdered glass was stirred into the top of the pile of sugar, and the firing wire dipped into the mixture. After that it fired every time and we got beautiful results.

(*Part II will appear in an early issue*)

BOILING OVER OF SIZE KETTLES

The Textile Section of the National Safety Council recently received a report on accidents due to the boiling over of size kettles. An investigation of the hazard was made by the company safety committee, and it was found that no trouble was experienced by the starch boiling over when thick starch was being boiled, but when thin starch was being treated, serious accidents had occurred due to boiling over of the size kettle. It seems, therefore, that special precautions must be taken in boiling thin starch. It was decided that safety precautions as follows should be observed:

1. That revolving blades in the kettles should be turned in such a direction as will cause the starch to be impelled down. It was found that blades if inclined at the wrong angle or revolving in the wrong way tends to cause the starch to foam over and splash.

2. That the best practice seems to be to observe the general safety rule of keeping the cover on the kettles locked down at all times when steam is on. (All kettles are boiled by injection lime steam). Under no circumstances should the size kettle cover be touched until the steam valve has been closed.

3. Small safety valves should be provided to allow steam to escape to prevent pressure from being formed in the kettle. Boiling may be regulated properly by noting the amount of escaping steam.

These rules are observed by cotton mills where safety is a major consideration. In this particular case the vents provided were two small holes drilled in the cover of the kettle near the center. A special latch is provided which consists of a small L shape strip of steel strap which is fastened down with a bolt with a wing not so that it may be easily operated by hand.—Textile Section News-Letter, National Safety Council.

STANDARD COLOR CARD READY

Announcement is made by the Textile Color Card Association of the United States that the Seventh Edition of the Standard Color Card of America is ready for issue.

This issue marks only the third change since the first Standard Card was brought out in 1915, and this change, like the two preceding ones, tends toward enlarging the range of colors now accepted as standard. It was made as a result of demands from industries for the addition of certain seasonal colors which, by reason of continued use and popularity, are now regarded by the industry at large as staple colors.

The association inaugurated a campaign to solicit suggestions from the members and affiliated industries. A printed questionnaire was mailed to each and a voting contest carried on which lasted many weeks. Every member was requested to list the names of the colors appearing on seasonal cards which in his opinion should be standard. If he considered his industrial color range was not fully covered by seasonal colors previously issued he was further requested to submit a sample of the color for consideration. As the number to be added could not exceed twenty-one colors by decision of the board of directors, the committee chose the colors from those receiving the most number of votes or in compliance with the urgency of the industrial demand. In compiling the Seventh Edition of the Standard Color Card of America the demands and needs of every industry were considered and the colors represent a collection of shades that are an answer to requests from silk, cotton and woolen industries, as well as from the millinery, shoe, hosiery and kindred trades. The card is most comprehensive in scope and represents the expression of the leading textile and allied industries of America, and in accord with the staple color demands of the industrial world.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

ERIO CHROME BLACK T

(Schultz No. 183)

Compared with Diamond Black PV (S-157)

COMPOSITION: Monazo.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Top chrome.

SHADE: T is greener than PV and somewhat duller overhead.

SOLUBILITY: Inferior to PV.

LEVEL: On slubbing the same as PV.

PENETRATION: Equals PV.

EXHAUSTS: Better than PV.

FASTNESS TO:

Acid: Equals PV.
Alkali: Equals PV.
Carbonizing: Erio Chrome Black T goes a trifle redder.
Cross-Dyeing: Equals PV.
Fulling: Fast to heavy fulling against white wool. White cotton stained a little; shade goes greener.
Ironing: Equals PV.
Light: Equals PV.
Perspiration: Equals PV.
Potting: Almost equals PV.
Steaming: Equals PV.
Sulphur: Equals PV.

SENSITIVE TO METALS, LIME: More sensitive to copper than PV.

ON UNIONS: Cotton-effect threads remain whiter with Erio Chrome Black T than with PV.

BENZO PURPURINE 4B

(Schultz No. 363)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt. The addition of soda ash helps, as the color is very sensitive to acid. Dyed with Glauber salt and soap, the color is a little brighter.

SHADE: Bright scarlet.

SOLUBILITY: Fair.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Will not stand even dilute organic acids.
Alkali: Fast.
Chlorine: Destroyed.
Fulling: Faster than acid reds. Stains white cotton but not white wool.
Ironing: Fast.
Light: Changes shade on seven days' exposure.
Rubbing: Fast.
Scouring: Scours off.
Steaming: Fast.
Washing: Bleeds badly.
Water: Bleeds in water at 104 deg. Fahr.

ON UNIONS: Cotton-wool unions: Both fibers about equal. Cotton-silk unions: Cotton is dyed a little darker.

ON OTHER MATERIALS: Paper: Used for full shades of red on wall papers; back-water clear; on sized paper add 2 to 4 per cent soda ash to neutralize the alumina; good for all unsized paper. Wool: Dyed with Glauber salt and acetic acid; much faster to acid than on cotton; fast in fulling against white wool, but stains white cotton; fast also to washing and perspiration; not fast to hot-pressing. Silk: Dyed with boiled-off liquor and acetic acid.

DISCHARGING: Discharges white with zinc dust.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Purpurine 4B; Cincinnati Chemical Works, under the name of Benzo Purpurine 4B (Selling Agents, Ciba, Sandoz and Geigy); Central Dyestuff & Chemical Company, under the name of Benzo Purpurine 4B Conc. (Selling Agents, H. A. Metz & Co.); Calco Chemical Company, under the name of Direct Red 4B; National Aniline & Chemical Company, under the name of Erie Red 4B; E. I. du Pont de Nemours & Co., under the name of Purpurine 4B; Newport Chemical Works.

BENZO PURPURINE 10B

(Schultz No. 365)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt and a little soda.

SHADE: Scarlet.

SHADE BY GASLIGHT: Goes yellower.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

(*Continued on page* 204)

Technical Notes from Foreign Sources

Degumming Silk

Raw silk is partially degummed by immersion in hot water, a peroxide such as sodium peroxide, or sodium persulphate, and sodium silicate or sodium phosphate being then added. The solution also contains a soluble inorganic salt such as sodium chloride. The treatment is continued until the silk is bleached and has acquired a soft handle and high luster. Dyeing may be carried out during bleaching by the addition of dyestuffs of suitable fastness to the bleaching bath. (English Patent No. 212,517.)

Washing Artificial Silk

Spools of artificial silk mounted on transportable frames are given a preliminary wash by sprinkling or pumping water through them and are then transferred to a vat in which the washing is completed with the aid of running water or water that is periodically renewed. The water from the second operation is used in the preliminary washing of a further batch of material, after which it is sufficiently acid to be advantageously used in the preparation of spinning baths. (English Patent No. 212,911.)

Action of Oxalic Acid in Aniline Black Dyeing

An interesting article has been published in the German paper (Chemiker Zeitung) on the action of oxalic acid in the development of Aniline Black by means of the bichromate process.

If aniline salt, in admixture with oxalic acid, is printed on cotton fabrics which has first been treated with dichromate, then there are formed what are known as immediate aniline blacks. The oxalic acid plays a similar role in the discharge of vat blue according to the chromate method. In this case the Indigo is oxidized to isatin. The action of oxalic acid in both cases is explained in the following manner:

The chromic acid is reduced with the formation of intermediate chromium oxide, either chromium dioxide or chromium tetroxide. This compound then breaks down at once to form chromium trioxide and oxygen. The oxygen is thus obtained in the nascent state and hence possesses great activity. There has also been produced by this method Alpha Naphthylamine Brown by taking alpha naphthylamine hydrochloride and printing the same on a cotton fabric which has first been treated with bichromate. This takes place in the presence of oxalic acid as above. The brown is formed at once.

Recovery of Fatty Acids from Used Soap Baths

The consumption of soap in the different parts of the textile treatment process, as, for example, in the soap dyeing operation, the wool washing process, the cleansing operations, washings, etc., is often very considerable. In almost all textile mills the waste waters, or rather the used soap liquors, are allowed to run into the sewer, in place of working them up for the recovery of the fatty acids that they contain.

Inasmuch as the exact method employed in the recovery of these fatty acids will vary considerably with local conditions, the concentration of the soap baths, the quantity of soap used and the various ingredients added to these baths, as well as the character of the impurities that the spent soap liquor will contain, merely the principles of the recovery operation can be described at this point.

It is known that all soaps are compounds of fatty acids with alkalies. It is possible to separate the fatty acid from the soap by decomposition with stronger acids. Then the separated fatty acids, because of their lower specific gravity, rise to the surface of the liquor and can be easily skimmed off and then subjected to further treatment. Separation of the fatty acids is nearly always accompanied by their emulsification with the water with which they come in contact. The drops of fatty acids which are contaminated with sizing materials and the like remain suspended in the fluid for a long time before they collect on the surface. This colloidal condition of the released fatty acids can be readily destroyed by means of heating or the addition of electrolytes such as acids and salts. Then the separation of the fatty acids is accomplished much more rapidly.

Nevertheless, in individual cases it is necessary to make a test to see if the soap liquors lend themselves to this recovery treatment. Where the amount of liquid is very large in comparison with the soap that it holds in solution, the question of economic feasibility arises. However, there are many cases in which the conditions are very favorable to recovery of the fatty acids in the spent soap liquors. For example may be mentioned the liquors that are recovered from the degumming of silk, in which case the spent soap liquors, as they leave the degumming baths, contain as high as 20 to 30 grams of soap per liter.

Although a part of this spent soap liquor is employed in the dyeing of silk, which is surrounded with certain disadvantages due to the impurities contained in the spent soap and to the diluteness of the solution, nevertheless, by far the greater part of this liquor is available for reworking. The apparatus used for this purpose is a kettle which is provided with pipe connections and a centrifugal pump so that the waste liquor may be sucked out of the baths and raised to a storage tank from which it can be fed to the retreating kettle.

The liquor is allowed to run in a continuous stream from the storage tanks into the kettle, and there the fatty acids are allowed to settle out and rise to the top, the operation of the process being rather automatic. This renders it possible to obtain a very cheap product in the form of fatty acids. The mixture of fatty acids and

liquor is then run into a series of cascade containers and the fatty residues are removed in that manner, while the mother liquor is allowed to flow away. After the concentration of the fatty materials has reached the proper point the mass is brought on a filter for the purpose of removing from it the greatest part of the water that it contains. In most cases this is not water at all but a colloidal mixture of water and fatty acid, together with various impurities.

There are two ways possible for recovering the fatty acids from this mass. In the first place, it may be extracted with the aid of suitable solvents, and then again it may be removed from the mass by pressing through filter presses. The extraction process can scarcely be used because of the cost involved, and then again the water that is present in the mixture of fatty acids would act as a deterrent. But when the recovery of the fatty acids is effected by means of the filter press, then the preliminary removal of the water is absolutely necessary.

The mass of fatty acids and water is introduced into a kettle which is indirectly heated and which is also provided with a stirring apparatus. After the mass has been dehydrated in this apparatus it is sent to the filter press. The fatty acids obtained in this manner consist of oleic and stearic acids, which are mostly dark colored and can be worked up into soaps. Furthermore, the press cakes, which also contain appreciable amounts of fatty acids, can be worked up further by extraction, but this is something that must be decided according to local conditions. The residues from which the fatty acids have been removed may be used as fodder for cattle or as fertilizer, and, furthermore, they may be worked up for the organic constituents that they contain. (Textilberichte, 1924, p. 243.)

Retting of Fibrous Matter

The fibrous matters are treated with the waste liquors derived from a process in which the vegetable substances are subjected to the action of potash or soda (NaOH or KOH). A certain amount of free alkaline hydroxide is added to these liquors. The process is carried out at a temperature of 90 deg. Cent. and the liquor used is from 0.2 to 4 per cent of the weight of the textile fabrics in respect to alkaline hydroxide content. To this is added a definite proportion of the waste liquors so that the density of the mixture is at least 1.074. For further details see Swedish Patent No. 51, 999.

Fireproofing Fabrics

The process which is patented in French Patent No. 556,577, consists in impregnating the textile fabric with two separate liquors. One of these liquors renders the fabric waterproof and the other makes it fireproof. The solution which waterproofs the fabric contains the following:

Water	100.0 liters
Lead acetate	7.5 kilograms
Pulverized alum	4.0 kilograms

This particular solution is employed at a temperature of 50 to 60 deg. Cent.

The fireproofing solution contains the following ingredients:

Borax	5 kilograms
Boric acid	3 kilograms
Pulverized alum	2 kilograms
Ammonium phosphate or sulphate	18 kilograms

The fireproofing solution is used at a temperature of 70 to 80 deg. Cent.

After the double impregnation has been effected the fabric is dried on racks or on a drum at a temperature of approximately 50 deg. Cent.

The proportions of the various materials used can vary within certain limits. The fireproofing or the waterproofing can be effected first with equally good results. It is also possible to mix the two solutions and accomplish both fireproofing and waterproofing in a single bath, and in this case it is essential to maintain the temperature of the bath below 60 to 70 deg. Cent.

Mercerization of Fabrics

The process which is described in French Patent No 560,968, employs calcium thiocyanate alone or in combination with the customary alkali for the mercerization of fabrics. It is feasible to replace the thiocyanate of calcium by other thiocyanates either in whole or in part. These thiocyanates are solvents of the cellulose. The process is carried out in the cold or at an elevated temperature and then the mercerization is completed by making the treated fabric pass through an atmosphere of hot air, steam or humidified air. The fabric is finally washed and dried.

Cold Bleaching Process

The composition of the bleach liquor that is employed in the process, which is described in French Patent No. 560,075, is as follows:

Water at a temperature of 25 to 30 deg. Cent.	94.5 per cent
Caustic soda	3.0 per cent
Chlorozone	2.0 per cent
Rosin	0.5 per cent

After the cloth has been treated in this bath it is acidified, washed well, chlorinated, washed again and neutralized. The process is simple and cheap and the bleach liquor does not attack the fiber substance, nor does it affect the dyes which are employed in coloring the fabric.

SURVEYS OF RECENT PROGRESS IN THE DYEING, PRINTING AND ALLIED INDUSTRIES

(*Continued from page* 186)

chiefly in the manufacture of rope and twine (1920, 224).

In a report submitted by the U. S. Consul on the manufacture of cocoanut fiber in Trinidad, it is stated that its production at the present time is not profitable (1920, 224).

The Director of Agriculture in Cyprus has contributed a general article to the Bull. Imp. Institute on the production of cotton, flax, hemp, wool and silk in Cyprus (1920, 224).

It is stated that artificial wool is produced in Germany by compressing wool scraps, etc., and soaking them in a solution of cellulose containing a small percentage of glue (1920, 225).

The Bull. Imp. Inst., 17, contains a statement that the fiber from the Wild Ginger plant cannot be remuneratively extracted in normal times (1920, 243).

Y. Hashimoto (1921, 58) has patented a process for the extraction of a fiber from seaweed.

B. P. Ehrenthal (1922, 207) has patented a process for the production of cotton substitutes from substances such as linseed and hemp seed, straw, jute, reeds, nettles, etc., which can be spun on cotton machinery by first fermenting the materials, then treating them with acids, organic solvents, alkali, and finally with an "isolating solution."

P. J. White (1922, 54) has patented a process for obtaining a fibrous zoophytic or polyzooic material from the sea which is supposed to resemble wool, is extremely absorbent and dyes readily and is resistant to atmospheric and chemical influences.

A process for extracting fibers from various plants was patented by M. Postiglione (1924, 157). It consists of treating the stalks with bicarbonate of soda and carbonate of lime, and passing them through breaking cylinders, followed by another boiling.

Paper and Paper-Making Fibers

Much valuable information is contained in a paper entitled, "Lignon Reactions and Constitution," by C. F. Cross and E. J. Bevan (1916, 135).

H. Wichelhaus and M. Lange (1918, 63) have investigated the constituents of wood which produce the red coloration with phloroglucinol.

An investigation of the chemical composition of alder wood by C. G. Schwalbe and E. Becker (1920, 226), has shown that the heart wood contains more lignin but less cellulose than the sap wood.

H. Pringsheim and H. Magnus (1920, 267) have replied to the criticism of Schwalbe and Becker that there is no relation between the proportions of lignin and acetic acid obtained by hydrolysis.

P. Klason (1920, 267) has shown that the lignin reactions are not due to the presence of a vanillin complex in pine wood.

F. Paschke (1920, 312) has shown that wood lignin and straw lignin do not possess the same properties. The sulphite process of boiling which gives excellent results with wood is quite unsuitable for straw.

P. Klason (1921, 58) has further investigated lignin, the lignin reactions and the constitution of pine lignin.

E. Beckmann, O. Oiesche and F. Lehmann (1921, 253) have determined the molecular weight of lignin obtained from rice straw.

W. Fuch (1921, 215) reviews the present state of knowledge of the lignin substances, with particular reference to the sulphite boiling process. He suggests that this operation consist sof at least two distinct processes, viz., the detachment of the lignin substance from its natural form of combination in the wood, and the conversion of the lignin substance into soluble sulphur compounds.

A summary of the recent work on lignin and a suggestion for a constitutional formula for a portion of the lignin complex are given by W. Schrauth (1923, 185).

The color-giving constituents of wood have been investigated by H. Wichelhaus (1924, 16). He states that the chromogenes of wood may be rendered soluble in alcohol by treating the wood with dye hydrochloric acid gas.

Comparative experiments with cellulose and lignin have been carried out by F. Fischer and H. Tropsch (1924, 87). They include hydrogenation, the action of alkali, autoxidation, oxidation, the action of nitric acid, and distillation in vacuo of lignin and cellulose, respectively.

W. J. Powell and H. Whittaker (1924, 158) have investigated the composition of lignin obtained from flax shoves. They have found that any formula suggested by other authors is not in accord with their data. They conclude that jute and pine lignin are essentially different from flax lignin, which is closely related to winter rye-straw lignin.

In order to increase the strength of paper yarn, G. S. Milde (1921, 253) has patented a process in which linen fibers are incorporated in the pulp which enables wet strips of the pulp to be twisted.

C. Doree and L. Hall (1924, 339) have published results of an investigation of the ligno-sulphonic acid obtained by the action of sulphurous acid on spruce wood.

The effects of mineral loading (China clay) upon the physical qualities of hedychium paper have been studied by Clayton Beadle and H. P. Stevens (1914, 89). The results have shown that the influence of different proportions of mineral matter in combination with different kinds of fibers upon the physical effects of the finished paper is very complex and deserves further and more careful study.

The same authors (1914, 92) have also attempted to determine the relative strengths of a number of fibers such as manila, sisal, hedychium and cotton.

The Department of Commerce, Bureau of Standards, Washington, has issued "Technologic Paper No. 88," which contains the results of the examination of several paper pulps in order to determine their chemical properties (1917, 127).

The digestion of wood in caustic soda with the addition of a small quantity of sodium sulphide, in order to pre-

vent the formation of oxycellulose, has been patented by C. N. Waite (1917, 157).

A patent has been taken out by Naamlooze Vennottschap Neo-cellulose Maatschappij, for de-inking of waste paper (1917, 198).

The Diamond State Fiber Company (1918, 16) have patented a process for rendering vulcanized fiber and vegetable parchment more flexible and waterproof by treatment with alcohol and an alcohol soluble oil.

"Cellulon" is described as a new textile material which is evidently nothing else but a special kind of paper yarn (1918, 130).

In a further reference to paper textiles we are informed that some two thousand tons of this material is annually employed in the German textile industry (1918, 207).

The Papier-Fabrikant informs us that paper thread of from 1 to 5 mm. in diameter is used in the cable industry and that similar thread made from parchment paper is used for weaving driving belts for light machinery. The treatment of paper thread with various solutions is also described (1918, 232).

C. F. Cross and E. J. Bevan (1919, 68) give results of some experiments conducted in 1916 with the exhausted bark of the Shorea Robusta, "Sal Bark," with a view to ascertaining its value as a raw material for the manufacture of paper.

H. Pringsheim and H. Magnus (1919, 286) have conducted an investigation into the origin of acetic acid formed by the dry digestion of wood and by the digestion of wood and straw with alkali.

C. L. Batchelder (1919, 286) suggests that the discoloration of bleached paper pulp by heat is due to the presence of chlorinated products.

R. C. Griffin (1920, 56), in order to estimate the percentages of different fibers present in a paper, recommends the "estimation method" in preference to the so-called "count method."

C. G. Schwalbe (1920, 244) states that fibers during treatment in the hollander are actually chemically altered. This is shown by a continuous increase in the reducing value with increasing mucilage formation and duration of treatment.

S. A. Mahood (1920, 289) discusses the value of the different methods for the determination of cellulose in woods.

Mats, sheets or fabrics of fibrous material are prepared according to a patent of the C. F. Burgess Laboratories (1921, 253), by passing shredded wool through a spray of adhesive.

E. Heuser and E. Boedeker (1921, 311) advance the view that all plant celluloses are identical with pure cellulose, and that there is in reality only one cellulose, $C_6H_{10}O_5$.

Some useful information on wood fiber yarns and fabrics is contained in a paper by R. W. Sindall (1922, 279).

Comparative experiments on cotton sliver and purified bleached sulphite cellulose have been carried out by E. Heuser and S. S. Aiyar (1924 92). The celluloses were acidulated and treated with 72 per cent sulphuric acid respectively.

J. C. Irvine and E. Hirst (1924, 120) have come to the conclusion that esparto cellulose, in the condition as used for paper-making, is a mixture of hexosan cellulose and of pentosan.

Testing

The swelling of textile fibers in water (turgescence) has been examined by E. Justin-Mueller (1914, 354) by means of an apparatus known as a "turgometer," specially constructed for this purpose. It is suggested that the degree of bleaching of vegetable fibers may be determined by this method.

F. Pickles (1915, 227) has ascertained the strength, elongation and weight of cotton yarns after various treatments, such as boiling, bleaching, mercerizing, dyeing, etc.

Cross and Bevan's reaction for jute, in which a mixture of ferric chloride and ferricyanide is employed, has been applied by R. Haller to cotton (1916, 18).

G. Kita (1917, 261) has found that Nishida's method of estimating oxycellulose is inaccurate.

A method for the determination of "wood gum" in cotton which has been incompletely purified has been suggested by M. Freiberger (1917, 261).

R. Haller (1919, 198) has described the behavior of various vegetable fibers when treated with a number of reagents. He suggests that their behavior should also be examined with the ultramicroscope.

A complete analytical scheme for the investigation of raw vegetable fibers and the cellulose derived therefrom has been outlined by C. G. Schwalbe (1919, 199).

F. Waentig and W. Gierisch (1919, 220) have suggested a method for estimating the degree of lignification of vegetable fibers which is based on the measurement of the quantity of chlorine which reacts with the fibrous material. The authors suggest that it might be possible to calculate the lignin content from the chlorine value of the material.

R. S. Greenwood (1920, 26) has carried out a large number of tests in order to ascertain the effect of certain industrial proecesss on the strength of cotton fibers and yarns. The results are recorded in tables and graphs.

P. Krais (1920, 85) has investigated the effect of moistening fibers with various liquids upon the tensile strain.

A. J. Turner (1920, 165 and 264) has studied the influence of atmospheric exposure on the properties of textiles, airship and aeroplane fabrics in particular. The effect of different methods of proofing upon the strength of the fabric has also been ascertained.

The tensile, the bursting and the ripping strain of cotton and linen fabrics has been investigated by J. Huebner (1921, 71). The effect of mordanting, dyeing, upon the tensile and the ripping strain of fabrics, forms part of the investigation.

A. Scheurer (1921, 254) has ascertained the amount of moisture and absorbed by silk, cotton, wool, etc., in air saturated with water vapor.

T. Barratt (1922, 117) has measured the breaking stress, extensibility and the elasticity of single textile fibers by means of an apparatus specially constructed for the purpose.

M. Pontio (1922, 208) has shown that the microscope alone is unsatisfactory for the detection of hemp and pseudo-hemp in fabrics. In conjunction with the "iodo sulphuric reagent" the detection is, however, possible.

R. O. Herzog (1923, 220) shows some interesting results as regards the appearance of natural fibers when examined by Roentgen rays.

R. Haller (1923, 347) has found that there are botanical differences between the cotton plants of the various growing areas and that these are indicated by differences in the seed pods and leaves, as well as in the cotton. By picking out the fragments of seed pods and leaves from a gray cloth and examining these under the microscope, he claims to be able to determine the type of cotton used in its manufacture.

An investigation into the changes which occur in cotton fabrics during calendering and beetling has been carried out by J. Huebner and V. Malwin (1924, 5).

A. E. Owen (1924, 20) has ascertained the effect of sizing from the point of view of resistance to repeated variations of tension, similar to what may be expected to occur in warp threads during weaving. An improved form of oscillating stress testing apparatus has been used for the purpose.

In a communication, "The Significance of Stress-Strain Curves of Yarns and Their Application in Testing," by G. F. New and A. F. Gregson (1924, 21), the authors state that it is now possible to obtain information relating to energy transferences and the changes of extensibility when yarn is subjected to cycles of loading and unloading, from "stress strain" curves and loops. Improvements in the recording testing machine used are described.

G. G. Clegg (1924, 120) has ascertained the breaking load of single cotton hairs by means of a modification of the apparatus originally employed by O'Neil. He has come to the conclusion that the diameter of a fiber is not an indication of its strength.

A. Geake (1924, 194) describes a rapid iodimetric method of the estimation of phosphorus in cotton, and he discusses the various possible sources of error.

P. H. Clifford, L. Higginbotham and R. G. Fargher (1924, 194) have examined the fat, wax and resin extracted from typical American and Egyptian cottons by various wax solvents.

The micro-analytical examination of small quantities of waxes, in particular cotton wax, has been described by R. G. Fargher and L. Higginbotham (1924, 195).

B. P. Ridge (1924, 197) has examined various modified Kjeldahl methods of determining the nitrogen content of cotton. He describes the methods which has been ultimately adopted in order to obtain accurate results. He has come to the conclusion that the determination of nitrogen content is of little value as a method for the chemical control of bleaching.

Summary of Patents for 1924

THE following list of patents on dyes and colors, dyeing, bleaching and finishing processes and machinery was culled from the Index of Patents for 1924, recently issued by the Patent Office. It is intended as a short but almost complete index to those patents which pertain especially to textile processes and which, consequently, should be of particular interest to dyers, textile chemists and dyestuff manufacturers. Complete descriptions of any of the patents may easily be obtained by communicating directly with the Patent Office at Washington.

Dyestuffs

Azodyestuff. J. Huismann. 1,483,447; Feb. 12.

Azodyestuff insoluble in water and making same. A. Zitscher. 1,506,514; Aug. 26.

Azodyestuffs and making same. H. Wagner. 1,493,577; May 13.

Azodyestuffs, insoluble in water and making same. A. Zitscher and A. L. Laska. 1,498,417; June 17.

Azodyestuffs, New. J. Haller. 1,503,044; July 29.

Dye and making same, Anthracene. H. T. Stowell. 1,492,110; April 29.

Dye and making same, Green vat. P. Nawiasky. 1,513,851; Nov. 4.

Dye and making the same. A. G. Green and K. H. Saunders. 1,483,798; Feb. 12.

Dye and making the same, Pyrazolone. E. A. Markush. 1,506,316; Aug. 26.

Dye, Azo. H. Clingestein. 1,483,415; Feb. 12.

Dye derived from acylacetyl compounds of diamins and making same, Azo. A. L. Laska and A. Yitscher. 1,505,569; Aug. 19.

Dye, Disazo. W. Neelmeier and K. Heusner. 1,504,134; Aug. 5.

Dye for wool of the safranine series, New. W. Herzberg and O. Scharfenberg. 1,518,847; Dec. 9.

Dye from dioxyperylene. A. Zinke and A. Klinger. 1,494,400; May 20.

Dye, Pyrazolone. L. W. Geller. 1,511,074; Oct. 7.

Dye solution and making and utilizing same. K. Luttin. 1,485,790; March 4.

Dye, Triarylmethane. M. Weiler. 1,503,177; July 29.

Dyes and making same. R. Arnot. 1,500,915; July 8.

Dyes, Azo. J. P. Penny. 1,509,442; Sept. 23.

Dyes, Blue trisazo. W. W. Bauer and H. E. Woodward. 1,498,316; June 17.

Dyes containing two hydroxynaphthalene nuclei, Monazo. F. Straub & H. Schneider. 1,521,206; Dec. 30.

Dyes, Diphenylnaphthylmethane. L. P. Kyrides, 1,504,061; Aug. 5.

Dyes insoluble in water and making same, Azo. A. L. Laska and A. Zitscher. 1,505,568; Aug. 19.

Dyes of the thioindigo series and making same, Vat. R. Herz and J. Muller. 1,498,913; June 24.

Dyes, Preparing triphenylmethane. J. R. Minevitch. 1,483,233; Feb. 12.

Dyes, Tetrakisazo. W. Lange and L. Neumann. 1,496,780; June 10.

Dyes, Tetrakisazo. W. Lange and L. Neumann. 1,504,125; Aug. 5.

Dyes, Triphenylmethane. L. P. Kyrides. 1,504,060; Aug. 5.

Dyestuff. H. F. Raeder and W. Mieg. 1,508,409; Sept. 16.

Dyestuff. J. Thomas. 1,490,646; April 15.

Dyestuff derived from anthraquinone and making same, Vat. B. Mayer, W. Moser, and J. Wurgler. 1,518,665; Dec. 9.

Dyestuff derived from pyrazolone and making the same, Azo. A. H. Schobel. 1,489,160; April 1.

Dyestuff intermediates, Manufacture of. J. Thomas. 1,504,164; Aug. 5.

Dyestuff, Oil-soluble. H. Plauson. 1,500,844; July 8.

Dyestuff Vat. P. Nawlasky. 1,505,912; Aug. 19.

Dyestuffs and making same, Alkylated derivative of vat. G. Kalischer. 1,489,225; April 1.

Dyestuffs and making same, Mordant. T. Lombard, 1,503,194; July 29.

Dyestuffs and manufacture of same, Azo. H. Fritzsche and E. Reber. 1,504,469. Aug. 12.

Dyestuffs capable of being chromed and making same. E. Reber. 1,485,814; March 4.

Dyestuffs consisting in treating decacyclene with sulphuric acid, Preparation of. K. Dziewonski. 1,496,085; June 3.

Dyestuffs containing chromium and manufacture of same. F. Straub and H. Schneider. 1,488,411; March 25.

Dyestuffs containing sulphur and making same. R. Herz and N. Steiger. 1,497,720; June 17.

Dyestuffs dyeing in reducing baths and their process of manufacture, Green. L. Haas. 1,501,769; July 15.

Dyestuffs, making same, and their application. G. de Montmollin and G. Bonhote. 1,504,437; Aug. 12.

Dyestuffs, Manufacture of chromium compounds of azo. F. Straub and R. Sallmann. 1,480,640; Jan. 15.

Dyestuffs, Manufacture of new vat. R. Tobler. 1,518,710; Dec. 9.

Dyestuffs, Manufacture of vat. M. P. Schmidt and A. Hagenbocker. 1,497,231; June 10.

Dyestuffs of the anthraquinone series, Manufacture of. A. G. Dandridge and J. Thomas. 1,518,051; Dec. 2.

Dyestuffs which consists in treating dinaphthylenethiophene by sulphuric acid, etc., Preparation of. K. Dziewonski. 1,496,084; June 3.

Dyeing and Other Processes—Dyeing Machinery and Equipment

Acetyl cellulose, Dyeing. J. Baddiley, J. Hill, and E. B. Anderson. 1,498,315; June 17.

Acid sludge, Treating. E. C. Higgins, Jr., and O. C. Smith. 1,487,240; March 18.

Acid sludge, Treatment of. W. N. Davis and G. A. Davidson. 1,511,721; Oct. 14.

Bleach apparatus, Liquid-. J. H. MacMahon. 1,481,107; Jan. 15.

Bleach solutions, Preparation of liquid-. J. H. MacMahon. 1,481,106; Jan. 15.

Bleaching fibrous material. V. Drewsen. 1,500,378; July 8.

Bleaching liquor and apparatus therefor, Making. J. R. MacMillan. 1,483,463; Feb. 12.

Bleaching or stain-removing composition and method. R. A. Phair. 1,514,068; Nov. 4.

Clothes and the like as a protection from moths, Impregnating. E. Naefe. 1,480,289; Jan. 8.

Coloring fabric, Process of and apparatus for. H. W. Lamb. 1,519,143; Dec. 16.

Colorimeter. L. A. Jones. 1,496,374; June 3.

Colorimeter. T. D. Simpson and A. C. Woodman. 1,495,763; May 27.

Cotton fabrics, Producing wool-like effects upon. H. I. Huey. 1,518,931; Dec. 9.

Daylight, Process and apparatus for artificially reconstituting. C. H. A. Gamain. 1,519,448; Dec. 16.

Dyed fabrics, Producing. E. Kirschenbaum. 1,518,585; Dec. 9.

Dyeing. P. Rabe. 1,517,581; Dec. 2.

Dyeing and the like, Machine or apparatus for. J. Kershaw. 1,507,779; Sept. 9.

Dyeing apparatus. L. P. Hart. 1,505,781; Aug. 19.

Dyeing apparatus. W. A. Traver. 1,511,380; Oct. 14.

Dyeing apparatus, Warp-. H. M. Chase and G. W. Robertson. 1,500,299; July 8.

Dyeing cloth with fast colors. G. J. and G. B. Mess. 1,486,353; March 11.

Dyeing machine. E. Allen. 1,483,263; Feb. 12.

Dyeing machine. T. Allsop. 1,492,916; May 6.

Dyeing machine. J. H. and D. M. Giles. 1,492,631; May 6.

Dyeing machine. R. C. Rahm. 1,485,886; March 4.

Dyeing machine. J. H. Thompson. 1,510,351; September 30.

Dyeing machinery, Reversing mechanism and safety stopping device for. R. N. Towers. 1,511,988; Oct. 14.

Dyeing machines. Drive mechanism for. J. H. and D. M. Giles. 1,510,667; Oct. 7.

Dyeing machines, Driving head for. J. H. Thompson. 1,510,352; Sept. 30.

Dyeing machines, Trip mechanism for. J. H. and D. M. Giles. 1,498,724; June 24.

Dyeing of cellulose acetate, artificial silk, films, and the like. M. E. Bouvier. 1,489,814; April 8.

Dyeing opalescent and fluorescent effects on wool and fur felt. J. K. von Gal. 1,510,250; Sept. 30.

Dyeing or analogous treatment of textiles, Apparatus for the. J., T., and J. Brandwood. 1,495,243; May 27.

Dyeing, scouring, or otherwise treating yarn and other fibers in the hank or skein, Apparatus for. H. M. Dudley. 1,519,769-70; Dec. 16.

Dyeing silk piece goods. J. Seyer. 1,495,614; May 27.

Dyeing, Warper for beam. A. R. Perrin. 1,507,251; Sept. 2.

Dyeing wool with dyestuffs capable of being chromed. P. Onnertz and A. Peters. 1,511,359; Oct. 14.

Dyeing yarn on cheeses, Material holder and carrier for. W. Bell. 1,500,046; July 1.

Fabric in web form, Holding apparatus for the wet treatment of. E. Nagelin. 1,515,514; Nov. 11.

Fabrics and other goods. Machine for treating or processing. E. P. Ford. 1,490,100; April 15.

Fabrics for removing sizing or gum therefrom, Treating. M. E. Bouvier. 1,517,888; Dec. 2.

Fabrics, Mercerization and finishing of textile. E. A. Fourneaux. 1,482,076; Jan. 29.

Fabrics, Ornamenting and proofing. L. J. Cavanaugh. 1,510,654; Oct. 7.

Fabrics, Treatment of union or mixed. R. Clavel. 1,517,709; Dec. 2.

Fabrics with a mercerizing or other liquid. Apparatus for impregnating. E. Farrell. 1,483,060; Feb. 5.

Fiber-drying machine, Textile-. J. F. White. 1,514,496; Nov. 4.

Fibers, Apparatus for treating textile. L. N. LaFayette. 1,507,839; Sept. 9.

Fibers, Spot-dyeing process for textile. H. Epstein. 1,498,079; June 17.

Fibers, Washing and degumming. R. L. Pritchard. 1,489,546; April 8.

Textile articles, Method of and device for finishing. F. Schuster. 1,488,293; March 25.

Textile fabrics or fibers, Treatment of. A. Boidin and J. Effront. 1,505,534; Aug. 19.

Textile materials, Process and apparatus for treating. T. Allsop and W. W. Sibson. 1,495,143; May 27.

Warp-dyeing machine. G. W. Robertson, W. T. Hogg, E. T. Garsed, and W. G. Benefield. 1,500,894; June 8.

Warp-treating apparatus, Long-chain-. H. M. Chase and G. W. Robertson. 1,500,298; July 8.

Water softening. F. E. and H. B. Hartman. 1,502,188; July 22.

Water-softening apparatus. J. E. Caps. 1,495,317; May 27.

Water-softening material, Making. S. Dahl-Rode. 1,482,601; Feb. 5.

Wool, Mordanting and dyeing. F. C. Telen. 1,492,051; April 29.

Wool-washing machine. F. W. Swain. 1,520,158; Dec. 23.

Yarn and other fibers in the hank or skein, Apparatus for dyeing, scouring, or otherwise treating. H. M. Dudley. 1,517,545; Dec. 2.

Yarn-dyeing device. G. T. Thomayer. 1,488,299; March 25.

Yarn-dyeing machine. G. T. Thomayer. 1,488,297-8; March 25.

Yarn warps upon dyeing beams, Apparatus for winding. B. K. Thies. 1,516,553; Nov. 25.

Zeolites, Regenerating spent. H. Kriegsheim. 1,485,334; Feb. 26.

Paper

Paper or textiles, Instrument for the automatic determination of moisture in. A. R. Harvey. 1,509,869; Sept. 30.

Paper pulp and for other purposes, Washing apparatus suitable for the treatment of. W. A. R. M. McRae. 1,520,580; Dec. 23.

Paper pulp, Preserving and treating. J. A. De Cew. 1,483,630; Feb. 12.

Paper-sizing composition. J. A. De Cew. 1,512,213; Oct. 21.

Paper-sizing composition and making the same. J. A. De Cew. 1,512,212; Oct. 21.

RECENT PATENTS

Process for Dyeing Wool with Dyestuffs Capable of Being Chromed

(1,511,359; October 14, 1924)

Paul Onnertz, of Berlin-Wilmersdorf, and Alfred Peters, of Berlin, Germany, assignors to Actien Gesellschaft fur Anilin Fabrikation, of Berlin, Germany.

By treating with chromium compounds, particularly chromic acid, wool, as is known, becomes harder. This has a most detrimental effect in dyeing with dyestuffs which require a treatment with chromic acid or other chromium compounds, more especially when a high proportion of chromate is necessary for completely fixing the dye, or when, as in art-wool dyeing, a material is used which has previously been chromated.

According to this invention in dyeing wool the deterioration of the physical properties of the wool caused by chromium compounds may be prevented by adding sulphite cellulose waste liquor or the evaporated and dried form of sulphite cellulose waste liquor containing the essential constituents thereof known as cellulose pitch or a constituent of sulphite cellulose waste liquor, such as a salt of lignine sulphonic acid, a sugar, particularly a pentose or a hexose. Shade of color and fastness of dye are not affected by the addition, but the wool retains its soft and full texture ("feel") and good spinning property. Moreover sulphite cellulose waste liquor acts also as a moistening agent and promotes the even absorption of the dye.

It has already been proposed to use sulphite cellulose waste liquor in the operation of preliminary mordanting wool; the invention does not extend to this use of sulphite cellulose liquor, but is concerned with dye baths or after-treatment baths.

The following examples illustrate the invention:

1. The bath contains: 3 per cent Fast Chrome Brown 2R, 10 per cent cryst, sodium sulphate, 4 per cent acetic acid of 30 per cent strength, 3 per cent sulphite cellulose waste liquor of 28 deg. Be. specific gravity, these per-

centages being calculated on the weight of the goods. The wool is introduced at 60 deg. Cent.; the bath is brought to the boil in half an hour and boiled for half an hour. For exhausting the bath 1.5 per cent of sulphuric acid is added and the whole boiled for another half an hour. Then in the same bath there follows a treatment with 1.5 per cent of the weight of the goods of potassium bichromate, a boiling for three quarters of an hour, and, finally, rinsing.

2. Into the bath containing 3 per cent Metachrome Brown B, 3 per cent metachrome mordant, 2.5 per cent sulphite cellulose waste liquor of 28 deg. Be. specific gravity, the percentages being calculated on the weight of the goods; the wool is introduced at 50 deg. Cent. and the bath is brought slowly to the boil and boiled for two hours. For the better fixation of the dyestuffs 1 per cent of acetic acid of 30 per cent strength is further added and the whole boiled for another half an hour.

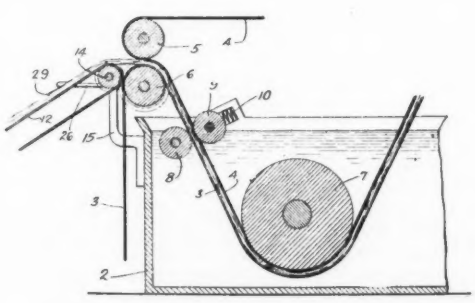
3. The bath is prepared with 2 per cent Anthracene Chromate Blue XR, 1 per cent potassium bichromate, 3 per cent magnesium sulphate, 2 per cent sulphite cellulose waste liquor of 28 deg. Be. specific gravity, the percentages being calculated on the weight of the goods; the wool is introduced at 70 deg. Cent., the bath is brought to the boil in half an hour and boiled for one hour; 1 to 2 per cent of acetic acid of 30 per cent strength is slowly added and the whole boiled for another half an hour.

Dyeing Apparatus

(1,521,594; January 6)

John Brandwood and Joseph Brandwood, Elton, Bury, England

A dyeing apparatus, comprising, in combination, a dyeing machine, a lap-forming machine, an endless apron mounted on machines for receiving the laps di-



rectly from the lap-forming machine and delivering them to the dyeing machine, means for driving dyeing machine, means for transmitting motion from the dyeing machine to said apron, and gearing for driving lap-forming machine from dyeing machine, gearing including a manually operated clutch for stopping the operation of the lap-forming machine while the dyeing machine continues to operate.

Azo Dyestuffs and Process of Making the Same

(1,522,089; January 6)

Hermann Wagner, Hochst-on-the-Main, and Otto Sohst, Hanau-on-the-Main, Germany, assignors to Farbwerke vorm. Meister Lucius & Bruning, Hochst-on-the-Main, Germany.

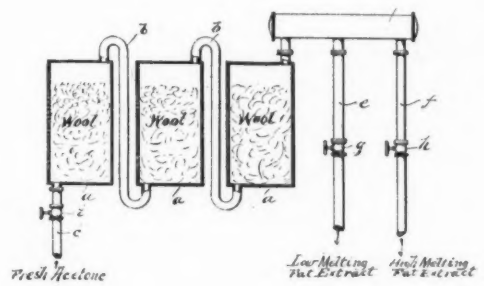
As new products the dyestuffs obtainable by coupling the diazo compounds of alkyl-aryl-and aralkyl amides of the alkyloxy-3-amino-1-benzoic acid with any 2.3-hydroynaphthoic acid arylides which, on reduction yield an aromatic amine and an arylide of the 1-amino-2-hydroxy-3-naphthoic-acid.

Process of Degreasing Raw Wool

(1,521,624; January 6)

Oliver Reginald Herzog, Berlin-Dahlem, Germany.

The process of degreasing raw wool, consisting in



first treating the raw wool with liquid acetone at substantially atmospheric temperature and then with acetone heated to at least 30 deg. Cent. and separately removing the liquid mixtures obtained.

Unshrinkable Wool and Woolen Material

(1,522,555; January 13)

Samuel Russell Trotman, Nottingham, England.

The process of rendering wool or woolen material unshrinkable, comprising subjecting wool or woolen material to treatment with a solution of hypochlorous acid substantially free from chlorine and containing about 0.5 per cent of available chlorine on the weight of the wool or woolen material for a period of between about 30 and 45 minutes.

Process for the Manufacture of a Cellulose Compound Indifferent to Substantive Colors

(1,523,742; January 20)

Robert Zimmermann, Tubach, Switzerland, assignor to firm of Textilwerk Horn A.-G., Horn-am-Bodensee, Switzerland.

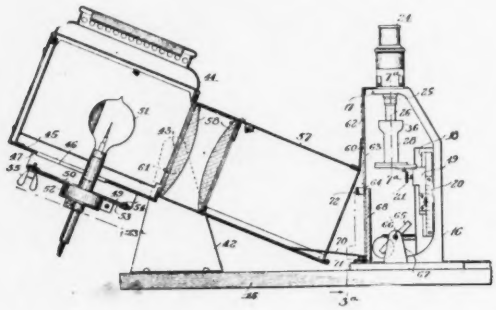
Process for rendering vegetabe fibers immune to substantive dyes, which comprises treating the fiber with akai and then subjecting the fiber to the action of a soution of aromatic sulpho-chloride in carbon tetra-chloride and washing the fiber.

Combined Colorimeter and Nephelometer

(1,522,592; January 13)

William L. Patterson, Rochester, N. Y., assignor to Bausch & Lomb Optical Company, Rochester, N. Y.

A combined colorimeter and nephelometer compris-



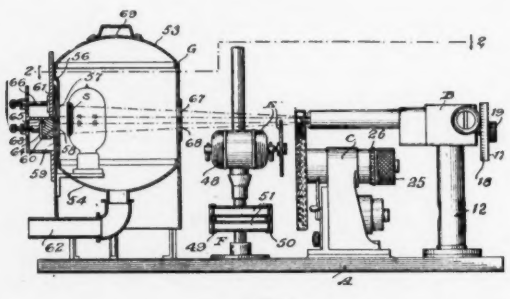
ing an optical system provided with means for holding standard and test specimens for observation and a light projecting system movable relatively to each other to selectively project the light through said specimens either transversely of or by reflection along the optical axis.

Color Analyzer

(1,524,180; January 27)

Carl W. Keuffel, Weehawken, N. J.

The method of testing or measuring the colors of a colored sample consisting in powerfully illuminating



the same, providing a circulation of air past said sample and thereby preventing change of color due to change of temperature during the powerful illumination of the same, and then measuring or testing the colored light proceeding from said sample.

Reaction Product of Phenols and Sulphur Useful as Mordants and Process of Making Same

(1,523,340; January 13)

Martin Battegay, Mulhouse, France.

The manufacture of mordants for dyeing, consisting in heating a body of the phenol group with sulphur in the presence of a small proportion of a halogen acting as catalyst.

DYESTUFF TABLES

(*Continued from page* 195)

FASTNESS TO:

Acid: Very sensitive to both mineral and organic acids.
Alkali: Fast.
Chlorine: Destroyed.
Cross-Dyeing: Not suitable.
Ironing: Changes shade temporarily.
Light: Very moderate.
Rubbing: Fast.
Steaming: Fast.
Washing: Moderate; bleeds off.
Water: Bleeds in water at 104 deg. Fahr.
Storing: Does not keep well.

MACHINE DYEING: Suitable for pad dyeing.

DYED BY OTHER METHODS: Not suited for after-treatment.

ON UNIONS: Cotton-wool unions: The cotton is dyed heaviest. Artificial-silk-effect threads are stained.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Benzo Purpurine 10B; Amalgamated Dyestuff & Chemical Company, under the name of Amidine Scarlet B.

DELTA PURPURINE 2B

(Schultz No. 366)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Similar to S-365, but not as bright.

SOLUBILITY: Very good.

LEVEL: Dyes level.

FASTNESS TO:

Acid: Not as sensitive as S-365. Fairly fast to acetic acid.
Alkali: Fast.
Chlorine: Destroyed.
Ironing: Fast; superior to S-365.
Light: Very moderate; same as S-365.
Rubbing: Fast.
Steaming: Fast.
Washing: Moderate; bleeds off.
Water: Bleeds in water at 104 deg. Fahr.

ON UNIONS: Cotton-wool: Both fibers dyed about equal. Celanese-effect threads stained.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Delta Purpurine 2B.

AMANIL GARNET DB

(Schultz No. 375)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Dull brownish violet.

SOLUBILITY: Good.

FASTNESS TO:
Acid: Fair against acetic; moderate against sulphuric.
Chlorine: Destroyed.
Ironing: Changes shade temporarily.
Light: Excels Benzo Purpurine.
Rubbing: Fast.
Steaming: Will not stand steaming.
Washing: Bleeds off.
Water: Bleeds in water at 104 deg. Fahr.

ON UNIONS: Cotton-wool unions: The cotton is somewhat bluer and a little heavier.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Garnet DB.

DIRECT BLUE 3R
(Schultz No. 378)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Salt and soda.

SHADE: Reddish blue, similar to S-377 but clearer.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Fair.

LEVEL: Dyes level as a blue.

EXHAUSTS: Fairly well.

FASTNESS TO:
Acid: Fast against dilute acetic acid.
Alkali: Fast against dilute alkalies.
Boiling: Loses less than S-177.
Chlorine: Destroyed.
Ironing: Fast.
Light: Moderate.
Perspiration: Fast.
Rubbing: Crocks slightly in heavy shades.
Washing: Loses less than S-377.

DYED BY OTHER METHODS: When after-treated with chrome it is faster to washing.

ON UNIONS: Recommended for cotton-silk unions, as the silk is left very light. Not as good for cotton-wool unions, as the wool is dyed a reddish shade.

ON OTHER MATERIALS: Wool and silk may be dyed in a neutral or acetic acid bath.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, under the name of Direct Blue 3R.

AMANIL FAST GRAY B
(Schultz No. 379)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Common salt.

SHADE: Redder than Benzo Azurine (S-410).

SHADE BY GASLIGHT: Grayish black.

SOLUBILITY: Twelve grains per liter.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: With acetic and sulphuric the shade becomes clearer and bluer.
Alkali: Turns redder with ammonia, and duller.
Chlorine: Destroyed.
Ironing: Redder and duller.
Light: Moderate; same as Benzo Azurine G (S-410).
Perspiration: Fast.
Rubbing: Fast.
Steaming: Fast.
Washing: Poor; bleeds badly.
Water: Bleeds off in water at 104 deg. Fahr.

OTHER PROPERTIES: Cannot be diazotized and developed. The after-treated shades change on washing.

ON UNIONS: Cotton-silk unions: The silk is stained reddish. Cotton-wool unions: The wool is deeper than the cotton.

ON OTHER MATERIALS: Wool: No interest. Silk: Dyes well, but the dyeings are not fast to water. Artificial silk: The color is adapted for this fiber.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Fast Gray B.

CORRECTION

In the Dyestuff Tables published in the March 9th issue the name of the Amalgamated Dyestuff & Chemical Works (selling agents, John Campbell & Co.) was omitted under Diamine Fast Red F, Schultz No. 343. This color is manufactured and marketed by the above under the name of Amidine Fast Red F and Amidine Fast Red F Ex. Conc.

The Newport Chemical Works has issued a leaflet describing Newport Anthrene Golden Orange 4R, the reddest of the Anthrene Golden Oranges. This color is described as very level dyeing and is said to combine well with other vat colors. It possesses excellent fastness to light, chlorine, boiling soap, steaming, cross-dyeing, acids and crocking. Pure silk is dyed somewhat weaker than cotton; Viscose, Chardonnet and Cuprammonium artificial silks are dyed well, while Lustron is only slightly tinted and Celanese badly stained. It is excellent for cotton printing and may be used for printing on silk.

DYEING AND FINISHING TEXTILES

The Department of Commerce announces that, according to the data collected at the biennial census of manufacturers, 1923, the establishments engaged primarily in dyeing and finishing textiles reported products valued at $342,229,850, an increase of 23.7 per cent as compared with 1921, the last preceding census year.

In addition, the dyeing and finishing of textiles are carried on to a considerable extent by textile mills, but in most cases such mills did not make separate reports for their dyeing and finishing departments.

Most of the work done in this industry is performed on a contract or commission basis, so that value of products represents, in the main, the amount charged for performing the dyeing and finishing processes, and the cost of materials is made up chiefly of the cost of chemicals and dyestuffs.

Of the 713 establishments reporting for 1923, 178 were located in New York, 160 in Pennsylvania, 146 in New Jersey, 75 in Massachusetts, 63 in Rhode Island, 16 each in Connecticut and Illinois, 8 in North Carolina, 7 in Maryland, 6 in Ohio, 4 each in California, Missouri and South Carolina, and the remaining 26 in sixteen other States.

On April 1 the Canadian office of the American Dyewood Company will be removed from Hamilton, Ont., to the Fairbanks Morse Building, 84 St. Antoine Street, Montreal, Que. This change affords greater facilities for service and convenience to customers.

The Salesmen's Association of the Chemical Industry will hold its regular monthly meeting on Tuesday, March 31st, at the Builders Exchange, 34 West Thirty-third Street. The speaker of the evening will be Major-General Amos A. Fries of the Chemical Warfare Service, who will address the members on "Chemistry and Warfare." As General Fries is well known in the chemical industry as an unusually entertaining speaker, and as the subject he will talk upon is one on which he is an authority, it is certain that the meeting will be well attended.

A sharp drop in exports of textiles and dyes from Switzerland to the United States in 1924 is reported by the American consul general. Aniline dyes declined to 664,856 pounds valued at 868,611, compared with 887,924 pounds, valued at $1,189,513 in 1923. Similarly figures for exports of cotton cloth, embroideries, knit goods, laces and trimmings show a heavy falling off from 1923 totals.

The Mathieson Alkali Works, Inc., moved its general offices on March 21 from 25 West Forty-third Street to 250 Park Avenue, New York City.

RIGA'S VANISHED DYE INDUSTRY

Before the war a dye industry of modest though adequate proportions existed in the city of Riga, a manufacturing center and commercial port of Latvia, Russia. According to information from Consul J. P. Hurley, the output of two dye factories employing 330 hands was valued at $1,675,000 in 1913. Over a million dollars worth of coal tar dyes were sent from Riga to Moscow and Irbit, and thence distributed among the various manufacturing centers in European and Asiatic Russia. In Latvia local consuming industries, comprising nearly one hundred factories, purchased a considerable quantity of Riga's dye output. For benzol and other crudes this dye industry was dependent on imports from Germany, Switzerland and England.

Riga's little dye industry exists no longer. The manufacturers of textile, paper and similar products in Latvia and adjoining territories are now entirely dependent upon foreign dye-producing countries for coal tar products.

David Lindsay, a graduate of the Textile Department of the North Carolina State College, has accepted a position as treasurer and manager of a mercerizing plant to be located at Spindale, N. C., which will be known as the Spinners Processing Company.

For a number of years Mr. Lindsay has been general superintendent of the Fieldale Mills, Fieldale, Va.

E. C. Klipstein Sons Company is planning the removal of its dye plants at Carteret and Chrome, N. J., to the main plant at Charleston, W. Va. The move will take place about May 1.

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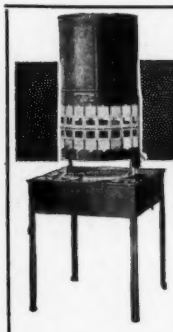

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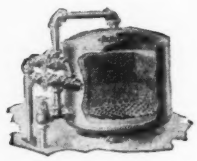

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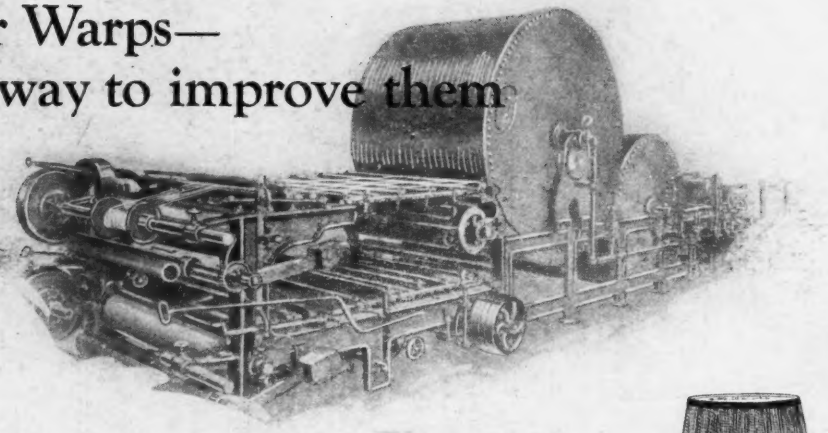

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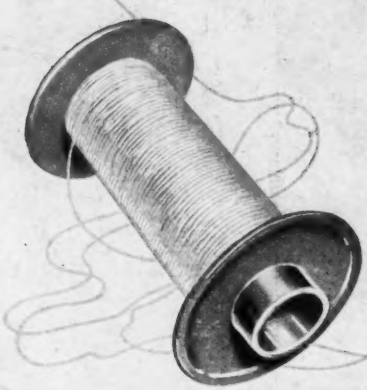

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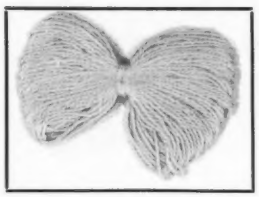

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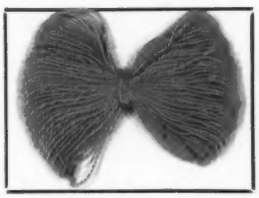

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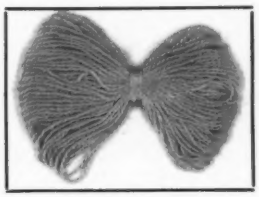

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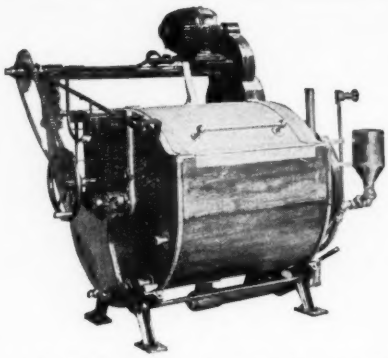

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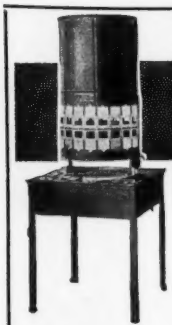

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"CELANESE" SRA GOLDEN YELLOW VIII	Daffodil	
"CELANESE" SRA GOLDEN YELLOW IX	Old Gold	
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"CELANESE" SRA RED I	Scarlet Red	
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"CELANESE" SRA HELIOTROPE I	Bright Helio.	**CR** (CELANESE RESIST) WOOL COLORS FULL RANGE
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"CELANESE" SRA BLUE IV	Pure Blue	
"CELANESE" SRA BLUE V	Deep Blue	
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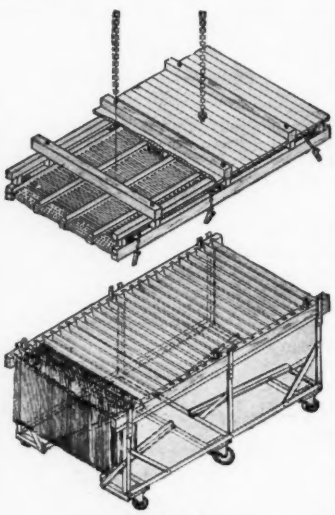

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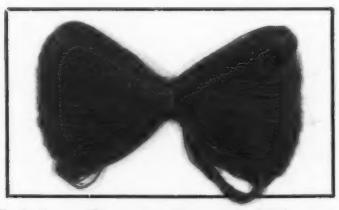
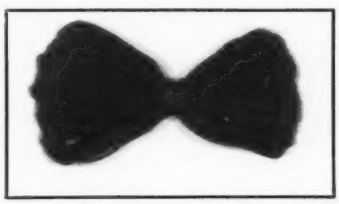


5 lbs. Sulphur Orange Brown GB extra conc.

5 lbs. Sulphur Orange Brown RB extra conc.



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The proportions are for 100 lbs. material

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Wherever soap is used in a natural water supply, lime soap curds will deposit on textile fibres as in the left-hand photomicrograph. Note how clean, softened water made the right-hand wool fibres. See text below.

Examine closely these two photomicrographs. The one on the right shows wool fibres that were scoured in conditioned water from which all the undesirable mineral impurities had been removed. Note how clean these fibres are. They will produce the finest quality of finished yarns and cloth. Then look at the other picture, which shows fibres heavily coated with lime soap deposits.

This wool was scoured in a natural water supply, and the small amount of lime that was present made the manufactured products very inferior in quality.

The mill which sent us these two samples saved thousands of dollars by properly conditioning its water supply, yet the company operated for years on moderately poor water without ever thinking to study it as other raw materials were studied.

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NEW YORK, APRIL 6, 1925

Technical Control in the Modern Silk Hosiery Dyehouse

Factors in Technical Control—Conditions of the Hosiery to Be Dyed—Dyes and Chemicals Employed —Regulation of Processes in the Dyehouse—Functions of the Laboratory—Dyehouse Conditions and Equipment

By LOUIS S. ZISMAN, B. T. C.

Gotham Silk Hosiery Company, Inc.

THE term "technical control" as generally mentioned in connection with dyehouse operation, too often appears nothing more than a nice sounding phrase that a chemist likes to employ and too frequently its real meaning and effectiveness are not clearly understood by many manufacturers as well as some of our dyers of the "old school" who, although they may have years of real sound practical experience back of them, yet do not keep up with the changes of time, nor with the progress made in the art of dyeing, and pay altogether too little if any attention to the very important role that textile chemistry is playing in facilitating dyeing problems and methods.

Trouble in the dyehouse is forever a general theme for discussion. While we must admit that the very nature of the dyeing process, with many complications involving the study and knowledge of the various textile fibers, the dyes and chemicals employed and the dyehouse conditions that have to be contended with, is such to always give rise to many difficulties, there is really no good reason why most of those troubles cannot be reduced to a minimum by exhaustively studying and digging right down to the source of trouble in a purely scientific manner. Some of our leading mills consider this work of prime importance in their plant operation. These mills are benefited by enjoying peace and "comfort" in the dyehouse. Not only that, but they are able to produce a higher grade dyed fabric at a lower cost of production.

The great cry to-day among the leading hosiery manufacturers is consistent production, uniformity of shade and quality; in other words, a stocking is desired which has better selling value, and which can be produced in quantity desired without unnecessary delay in time. Since these requirements are dependent to so great an extent upon the kind of treatment the hosiery receives in the dyehouse, my answer to their demand is proper technical control in the dyehouse as well as in the other departments.

By technical control in the modern silk hosiery dyehouse, I refer to a system of plant operation so conducted that the following factors are taken fully into consideration and effectively carried out:

1. Knowledge of material to be dyed, i. e., condition of the hosiery as it is received in the dyehouse.
2. Knowledge of the dyes and chemicals employed, i. e., properties of the dyes, water, soap, oil, bleaching agents, etc.
3. Regulation of the degumming, dyeing and bleaching processes in a manner that is best adapted for the condition of the hosiery in the gum, the dyehouse equipment available, and the special requirements of the finished stocking.
4. Proper functioning of a laboratory to solve scientifically dye problems, to make all necesssary tests, and to carry on research with view of improving methods.
5. Possibilities of improving conditions and equipment.

These five channels of control will now be briefly discussed in the order as listed above.

Conditions of the Hosiery to Be Dyed

Silk hosiery should not only be examined for defective knitting parts in order to properly adjust the knitting machines, but should also be thoroughly inspected and tested from the dyer's standpoint, since the latter must know fully about any existing defects and irregularities not only of the knitting but also of the fibers themselves, both factors materially affecting the uniformity of the dyed stocking. It is a very good practice to periodically test the fibers which consist of pure or tram silk and mercerized cotton in better grades of hosiery, while arti-

ficial silk is included in less expensive grades. The tests for strength and elasticity are rather simple and should be made at the time the silk and cotton arrive from the throwsters and mercerizers respectively, after the knitting process, and finally after the stocking has been finished. These tests will indicate any weakening of fibers that may occur and will also show at what stage of manufacture that weakening has taken place.

Very often we get a silk that has natural yellow staining matter, sometimes referred to as a "rusty silk." For whites and light colors this silk should be avoided. Insoluble identification tints on the gum silk should also be avoided, especially in the case of whites and light colors. For whites it is advisable to use a soluble sky-blue tint.

In order to remedy the above faulty conditions and to carry out the examination of the stocking before entering the dyehouse to the best advantage, it is highly desirable that the knitting and dyeing departments work co-operatively and bring to the attention of the throwsters and mercerizers any defects found in the raw stock itself.

Dyes and Chemicals Employed

A knowledge of the proper selection of colors is, of course, essential. It is usually the case that the dyer will know which colors will work together to get the required shade. However, it is surprising how many hosiery dyehouses make no attempt actually to test their dyes for strength, shade and fastness to light and washing. Not only would this work mean a saving in the purchasing of dyes, but the tests would indicate to the dyer the changes that have to be made in the dye formula, instead of assuming that the new batch of dyestuff is the same as the previous shipment. The use of a color without knowing how it compares to a standard often necessitates running goods too long a time and in the case of light shades especially the dye bath may be thrown off shade entirely. With reference to the many complaints of color fading out from the dyed stocking, it is well to note that it is a comparatively simple test to find this out before the fugitive color goes into the stocking.

Chemicals should also be carefully examined. We must not lose sight of the fact that water, although comparatively inert and usually acting nothing more than a medium in which the dyeing takes place, is one of the most important chemicals to consider. The detrimental influences that a hard water has in the silk hosiery dyehouse or any place where large quantities of soap are used, are well known to-day. The formation of insoluble lime soaps which are difficult to remove and cause spots in hosiery and the high wastes in soap can be eliminated by correcting the water.

A neutral olive soap free as far as possible from alkali (in free state) should only be used for silk. Degumming oils which essentially consist of sulphonated castor oil or olive oil plus silicate of soda have come to be used extensively in place of soap. Although these oils cost less than soap and it is claimed they give very good results, there is the danger of the oil containing excessive amounts of silicate of soda, and due to the general difficulty in complete sulphonation the oil is apt to break up in the dyeing and gumming processes, causing grease spots in the stockings.

Regulation of Processes in the Dyehouse

The successful carrying out of the degumming, dyeing and bleaching operations taxes the utmost skill of the dyer. It is not the purpose of this article to discuss any special method but the importance of adapting the process to meet the requirements of the finished product, the condition of the hosiery as it is received in the dye plant, and the conditions of the dyehouse and equipment available, cannot be overemphasized. Control of the time element, the temperature, the dye formula, the time of addition of the various ingredients are essential in order to get uniformity of shade and quality.

The value of processing a dyeing or bleaching operation that is best adapted for hosiery machinery has been clearly demonstrated in the last few years. The extensive use of hosiery machinery is of recent date. With the open wooden vats which were formerly used any scum forming on the surface of the liquor could easily be removed, but the removal of such scum formation in the rotary type dyeing machine is out of the question. The adaptation of a method of boiling off and dyeing in one bath, however, has made it possible to turn out clean hosiery with seams and splicings well penetrated and with considerable saving of time and labor. With the use of Monel metal machines very satisfactory results can be obtained in bleaching and degumming in one operation.

Functioning of the Laboratory

In order that the laboratory may be of any real use to the department of dyeing it is essential that strict and confidential co-operation exist between the dyer and chemist. The real purpose of the laboratory is to have within the mill an agency that is ever ready to solve dyehouse problems which require scientific investigation, an organization, whose business it is to check up and test regularly all incoming dyes and chemicals. The importance and value of these tests have already been mentioned under "Dyes and Chemicals Employed." The laboratory should also serve as a means for carrying out research with view of improving methods and enhancing desirable qualities in the silk stocking.

Dyehouse Conditions and Equipment

The dyehouse on the part of some companies is looked upon as a necessary evil and very little or no attention is given to the condition of light, ventilation and the application of labor-saving devices, machinery, etc. When such is the state of affairs there is generally a great loss in efficiency, and the standard of quality of the finished stocking is apt to be lowered rather than improved. It is often up to the dyer himself to win favor in the eyes of

the manufacturers and convince them why it would pay to improve general conditions and equipment. The dyer when called upon to make such changes must be able to designate just what conditions are best suitable for the dyehouse and also be able to pick out the type of machines best adapted for this class of goods.

In conclusion, I might state that the clue for the successful running of the dyehouse according to modern lines is to know where the source of trouble exists and how to remedy same. The old slogan that "An ounce of prevention is worth more than a pound of cure," should be followed in dyeing.

Microscopical Vision in the Study of Knitted Goods

What the Microscope Shows—Methods of Employing Microscopic Vision—Examples of Its Practical Use

By A. K. JOHNSON

Lowell Textile School

MICROSCOPICAL vision has many interesting and profitable applications in the comparative study of different designs in knitted materials, and in the determination of the causes for many of the irregular or abnormal appearances in the finished fabrics. The values are derived: (1) from the increased distinctness which magnification gives to details otherwise not clearly seen, and (2) from the ability to make accurate and definite deductions from the readily made and highly accurate measurements of the sizes, character, positions and condition of the yarns, loops and openings in the fabric. The same may be applied to the needles and other delicate parts of the knitting machine which have anything to do with any of these properties of the goods.

Many of the streaked places and the locally lustrous or dulled areas, and the thick and thin places, suggested to the naked eye in ordinary light, seem frequently to be related to some of the following factors which can be better shown by microscopic vision:

(1) Variations in the sizes of the different yarns, or in the same yarn through non-uniformity in manufacture or induced by unequal strains or tensions in knitting, winding or handling.

(2) Differences in the character of yarns introduced at one time or place, or changes in the position of the yarn because of altered or improper adjustment of the

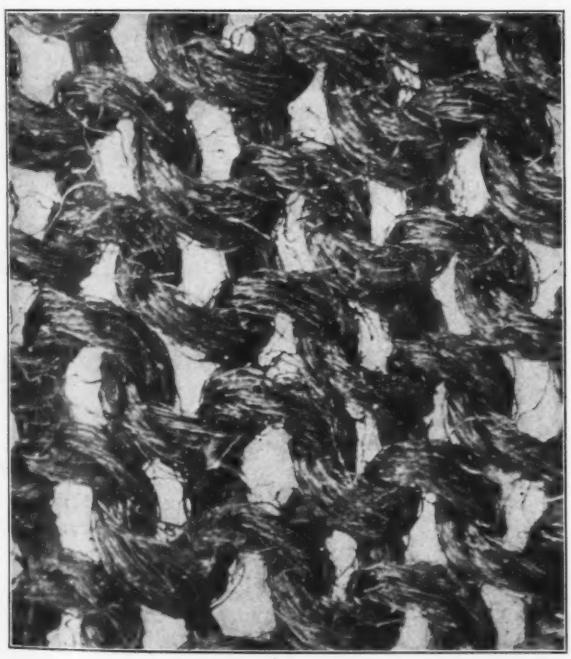

FIG. 1.—*Cotton Knit Goods.*
Observe clearness of detail and, by divider measurements, how easily your sizes are found or variations in position noted.

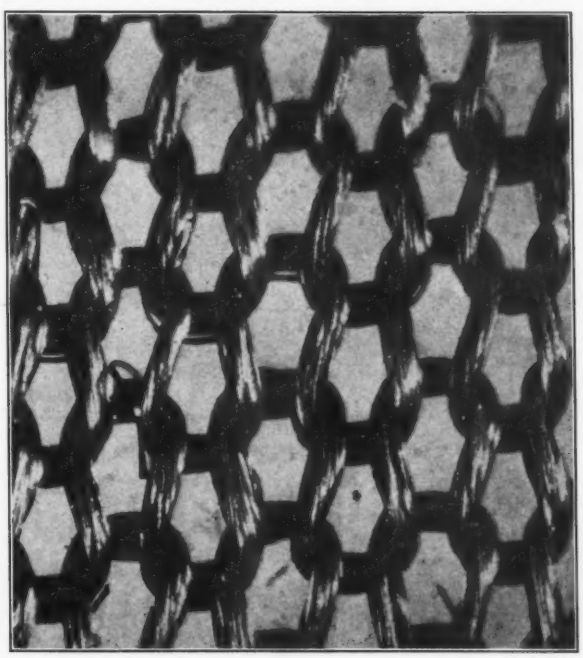

FIG. 2.—*Artificial Silk Knit Goods.*
Ideal for microscopic examination. Compare character of yarn-structure, regularity and clear condition.

needles or parts, or on account of alterations in the direction of looping.

(3) Non-uniformity in the cleanliness of the yarn, on account of lubricant stains or other foreign substances

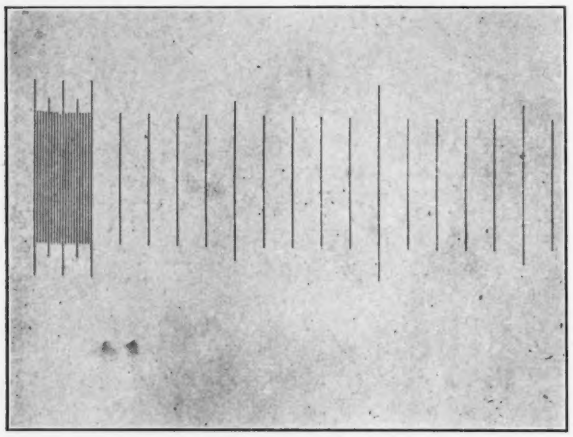

FIG. 3.—*Micrometer Scale (Microscopical). By placing one line of scale tangent and parallel to an edge of yarn the number of scale divisions covered by yarn gives the yarn size.*

in the spaces between the fibers of the yarns, or of the fuzziness of the yarns especially as produced by accidental bruises, cuts, or chafing, All of these factors tend to produce results which are often more readily studied with the aid of microscopical vision.

Fig. 1 shows a cotton yarn knitted sock. The clearness of the details, the ease with which even slight differences in the yarns (size, position, fuzziness) can be observed is evident. In measuring the relative sizes of openings or yarns in the wales, from the picture, it is only necessary to use dividers or similar fine instrument. For absolute size a microscopical micrometer may be used while the goods are in the microscope or the magnification determined when making the picture. The measurement found from the picture, divided by the times' magnification, will give the true size. The micrometer scale itself may be photographed under similar conditions, and the measurement of yarn compared to this projected scale for determining true size.

Fig. 3 illustrates a micrometer scale by which very fine measurements may readily be made through the microscope. It is necessary, of course, to avoid any undue tension or flattening pressure on the mounted sample while taking the picture or in making the measurement in the instrument.

Fig. 2 is from a fabric similar to that of Fig. 1, made

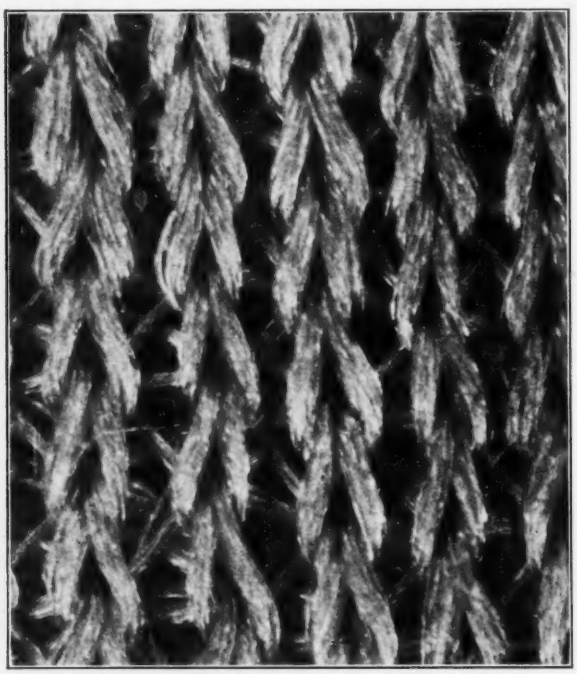

FIG. 4.—*Knitted Glove Fabric, Showing Structure (face).*

FIG. 5.—*Knitted Glove Fabric, Showing Structure and Condition of Yarn (back).*

from artificial silk. The great difference in the character of yarn (its structure and clean or smooth appearance) is apparent. Any bruises, cuts or loose filaments from this yarn could easily be detected by the eye from a magnification of this sort.

Figs. 4 and 5 are from another type of fabric, representing front and back respectively. The clean-cut appearance of the front is entirely evident. The arrangement of threads, and the scattered condition of some of the filaments in the back, are well defined.

Figs. 6 and 7 show other styles with the differences of composition in yarns.

Fig. 8 illustrates how the structure and composition of union yarns may be made visible by producing differences in color depending upon differences in chemical composition. This yarn is composed of artificial silk and real silk twisted together. The real silk is stained a red while the artificial silk is white.

Fig. 9 gives an idea of how yarn uniformity may be seen and recorded. The thin and bunched places and the

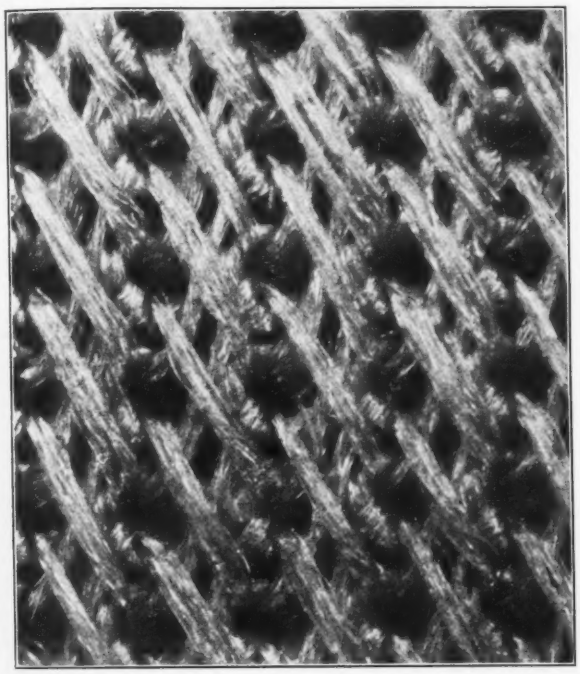

FIG. 6.—*Knitted glove fabric (silk), showing structure and uniformity.*

loose fuzz are revealed with distinctness. Large areas, of course, are studied in actual practice.

Figs. 10 and 11 picture bleached cotton fibers and mercerized cotton fibers from yarns. Such fiber study is sometimes required to show type and grade of fiber and the kind or treatment for special purposes.

METHODS OF EMPLOYING MICROSCOPIC VISION

There are three different ways by which the benefits of microscopic vision may be obtained, each way having merits of its own:

(1) By direct vision through the microscope itself, valuable for a single individual at one time to obtain the facts of the case for himself. Obvious drawbacks are:

(a) The difficulty and inconvenience of demonstrating to other companions the particular points in question.

(b) The need for carrying the instrument and the sample along wherever and whenever its appearances are wanted.

(c) The psychological effect upon those who are not

FIG. 7.—*Knitted glove fabric (cotton), showing structure.*

familiar with the instrument and its use, and who, therefore, for a while "cannot see anything" through it. This may give rise to confusion, error, misunderstanding and an antagonism to the instrument and its revelations.

In short the microscope itself is not well adapted to convenient group discussions of its appearances, especially with those uninitiated to its use.

FIG. 8.—*Knitted fabric showing distribution of real silk (dark), and artificial silk (white); also structure and uniformity.*

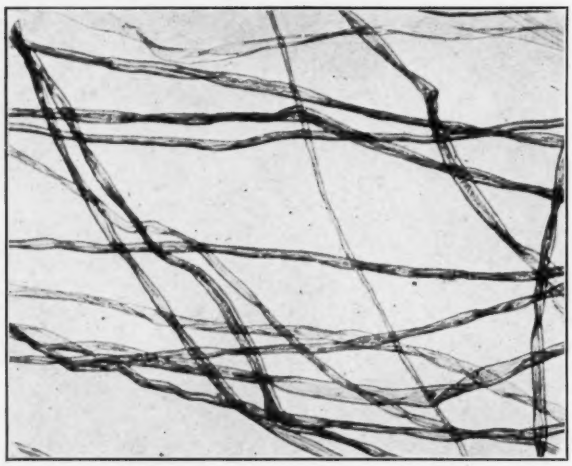

FIG. 10.—*Bleached cotton fibers from a woven thread.*

FIG. 11.—*Fine, mercerized cotton fibers from yarn.*

(2) By projection of the image produced by the microscope directly upon a ground glass screen or onto a curtain. Fig. 12 is of a form of low power projection microscope adapted to a projection lantern, which seems to have good possibilities for the direct, rapid study of the characteristics of a large area of openly knitted materials by a large group of interested observers. The image on the screen is sufficiently magnified at 15 feet or so, for one to demonstrate the irregularities or abnormal appearances from the image. The light, of course, ordinarily comes through the fabric and therefore, usually, gives a silhouette type of image. It is reasonable to believe that a strong light could be thrown upon the surface of the fabric and the surface effects thereby noted, if necessary. The chief advantages with this instrument are the rapidity of obtaining results and convenience for

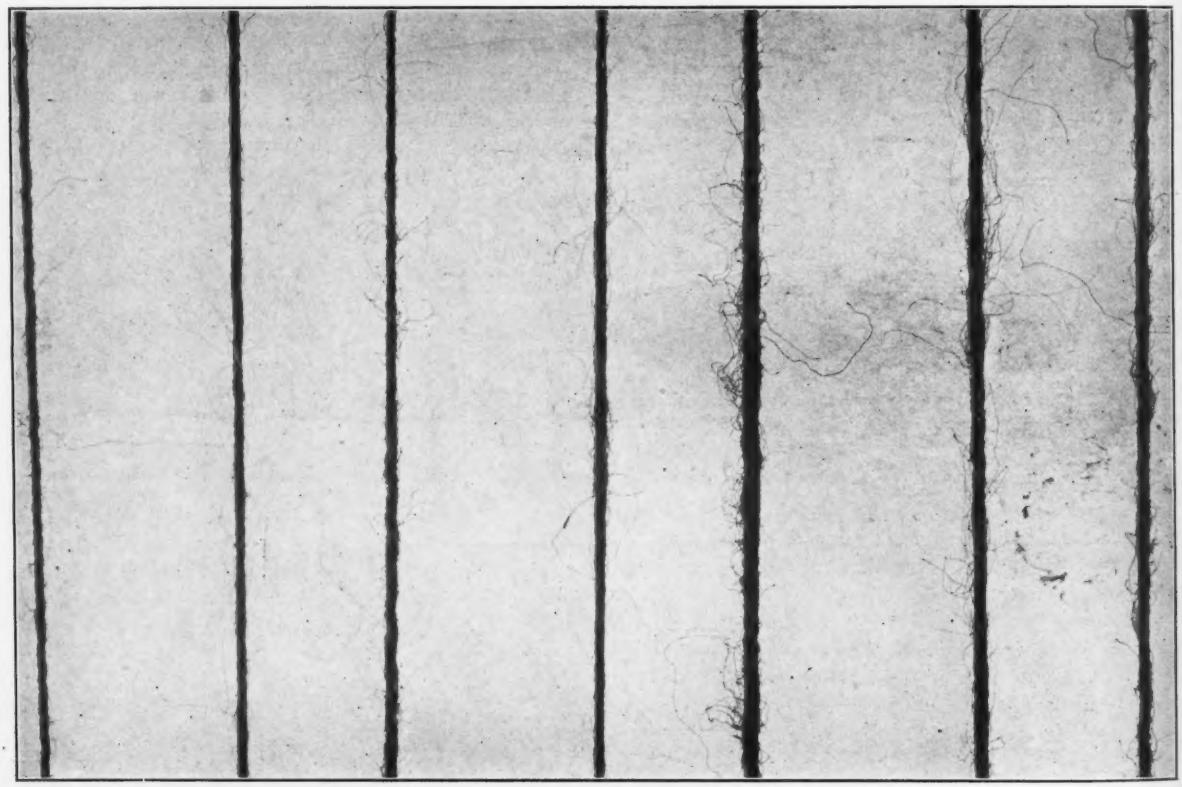

FIG. 9.—*Small section illustrating study of yarn uniformity. The bunched, thin or fuzzy places are easily noted and studied by microscopical methods.*

group observation of the fabrics. Some disadvantages are that a darkened room is needed, the fabric must be reasonably open and the yarns not excessively fuzzy. The image, like that of the visual microscope, is only temporary; the information is tied up with the instrument and sample. The magnification is low. By using other forms of projection miscroscopes, higher magnifications of smaller areas may be thrown onto ground glass. A general survey can be made from observing several fields or portions of the materials in succession.

(3) The microscopic image may be focused upon the ground glass screen of a camera and photographed. Photomicrography permanently clinches for the eye, in black and white upon paper, the characteristic appearances of the fabric. It provides a permanent record, which can be filed and be instantly available, which yields its information to the eye at once, and is entirely freed from any subsequent need for the microscope or that particular sample. Furthermore, the information may be duplicated from the negative, time without number and for the use of the facts in any form that is known to photography—prints, enlargements, lantern slides, advertising illustrations. These properties of photomicrographs thus make it possible for any number of people to use the information at any time, in any place and individually or collectively.

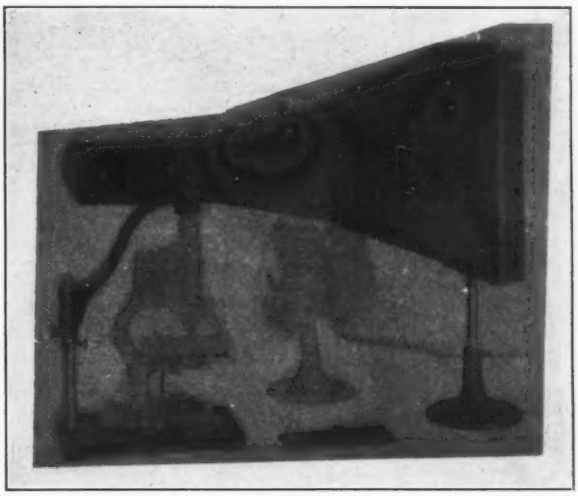

FIG. 13.—*The "Euscope" adaptation for microscopic projection, arranged for individual or group projection, also adaptable to photomicrographic recording. Simplicity and rapidity in examination are features.*

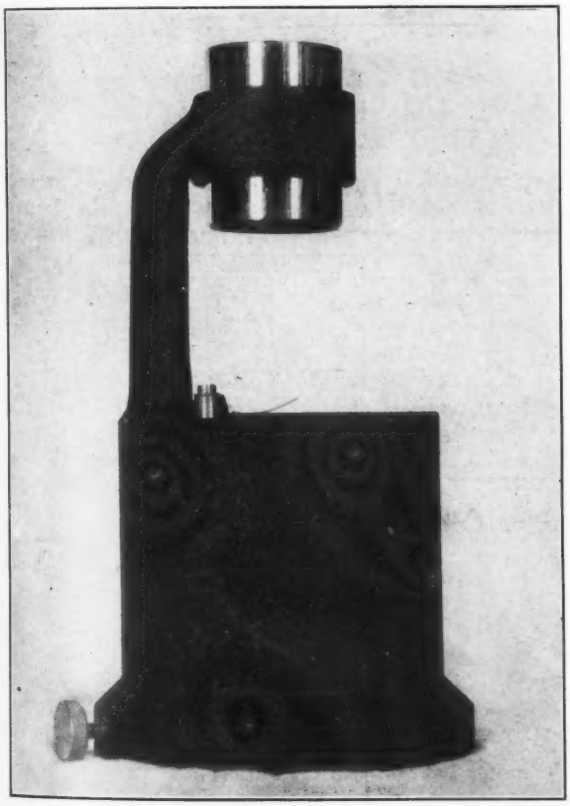

FIG. 12.—*A form of projection microscope adapted to use with projection lantern or similar device. Other forms of projection microscopes are available for higher powers of magnification.*

Thus the photographic way is an excellent one for the accumulation of experience and for the presentation of the facts for any form or discussion concerning them (legal, educational for salesmen, workmen, customers or advertisers), to those familiar with the use of the microscope or not. It furnishes an excellent way for increasing the sphere of influence and usefulness of microscopic information, with respect to time, distance and numbers and training of individuals.

Microscopic vision, applied in one or all of its phases for particular purposes, possesses good advantages for use in solving many of the problems related to knitted goods.

RHODE ISLAND SALESMEN ORGANIZE

Thirty-five drug, dye and chemical salesmen, representing twenty-three Rhode Island manufacturing chemists and wholesale dealers in chemicals, drugs, dyes, oils, soaps, etc., have formed the Allied Chemical Salesmen's Association.

The Ogontz Manufacturing Company has started operations on the third floor of the building at the southwest corner of Mascher and Turner Streets, Philadelphia. The company will manufacture rayon underwear cloth and knitted cloth for dresses. Wm. H. Haselton and Alfred M. Cohen are the proprietors of the enterprise. Equipment consists of eight circular knitting machines and three winders, using electric power. They will buy cotton, rayon, wool and worsted yarns.

Dyeing Acetate Silk

Part II

Dyeing Acetate Silk as Compared with the History of Cotton Dyeing—General Dyeing Properties—Scouring Methods—Bleaching

By CHARLES E. MULLIN, M.Sc., F.A.I.C.

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IT will be remembered that the dyeing of acetate silk was not the first problem of its kind that the textile industry had faced. The dyeing of cotton was in about a similar predicament before the discovery of the direct cotton dyes. However, the chemists of to-day are much better equipped to combat such a situation, and we have a much wider range of more or less suitable dyes to use as a start. Up until the last two or three years there was no special class of dyestuffs for acetate silk, and no one class of dyestuffs which would give reasonably fast shades in all colors and which could be used in wide combinations with other dyes on unions, etc. While certain commercial dyes and other compounds are applied to it with more or less satisfaction, acetate silk in general exhibits far less attraction for the ordinary dyestuffs than any other known fiber.

It has almost no affinity for most of the direct cotton dyes. In fact, it resists about 60 per cent of the direct cotton dyes to such an extent that patents were at one time granted on a process of resisting cotton by means of acetylating the outer layer of the cellulose fibers. A product known as "Bayko yarn" also appears in the literature. This yarn was prepared by coating a cotton thread with cellulose acetate solution and could be used as a resist, or by mixing finely powdered metals in the acetate coating solution some wonderful metallic effects were obtained.

General Dyeing Properties

In short, acetate silk has dyeing properties peculiar to itself and entirely different from any other known fiber. The main difficulty and chief drawback in dyeing it was that everyone wanted to use the known common dyes upon it by the ordinary dyeing methods. We cannot successfully dye cotton with wool dyes or wool with substantive dyes as a class. Therefore, as a new class of fiber we might only expect satisfactory results from a new class of dyes developed particularly for it, the same as we have certain classes of dyes for the other known fibers of different origin and characteristics. Also, the two varieties of acetate silk—i. e., Lustron and Celanese—do not have exactly similar dyeing affinities, react differently in very hot water, etc.

At temperatures above about 85 deg. Cent. (185 deg. Fahr.) Celanese becomes "blind," or loses its luster; and on treating Celanese for even a few minutes in boiling water it shrinks and the luster is completely destroyed. Hot-ironing with a damp cloth also injures Celanese, but dry-steaming for even fifteen minutes without pressure does not seriously damage it. In fact, such steaming is used in printing Celanese. The manufacturers of Celanese warn against the use of alkalies, but state that it will withstand the usual alkaline emulsion finish or an acid finish containing 2 c.c. per liter of formic acid.

On the other hand, H. S. Mork, of the Lustron Company, states that "Lustron can be boiled without affecting its luster or general appearance. This enables it to go through a regular silk boil-off and dyeing at boiling temperatures without alteration of its appearance. Lustron can also be mercerized by the usual procedure without losing its cross-dyeing properties." The above facts merely emphasize the differences in the two varieties and in the manner in which they may be dyed. Apparently most of the available data upon dyeing acetate silk applies particularly to Celanese. A statement by Mr. Little to the effect that it was possible to combine Lustron and Celanese and by the use of certain suitable dyes the Lustron would be dyed, while the Celanese would be left white, also serves to bring out this difference in their dyeing properties.

As more work was done on dyeing acetate silk the outstanding facts regarding its dyeing properties became apparent and led to certain theories and research along particular lines. Professor Green, who has been one of the pioneers in this research, states that in many respects the dyeing of acetate silk resembles a solution phenomenon similar to the dyeing of a hydrocarbon like paraffin wax. Very nearly the same relationships hold good in regard to the various dyes; as, for instance, the Sudan dyes, which dye both acetate silk and oils.

Acetate silk has no affinity for the soluble salts of the metals, nor will it take up their hydroxides to any extent, either as precipitates or as colloidal solutions. It has no affinity for tannins or the other usual cotton mordanting agents. In short, no mordant has been successfully applied to it. However, certain metallic salts, etc., have been used in dyeing it and in after-treating certain dyes upon it to give them increased

fastness, and it has an affinity for the majority of the mordant dyes without a mordant.

Hall [Textile Colorist, 46, 154 (1924)] points out that substances which form stable or water-soluble salts, either with alkalies or acids—as, for instance, orthohydroxybenzilideneacetone or aniline—are absorbed by the acetate silk, but are largely removed by washing. This applies to several of the basic dyes which are affected in this way, including some of the Rhodamines, with the exception of Rhodamine S.

It was found that the size or complexity of the dye molecule played some part in its absorption by acetate silk. In a general way, the lower the molecular weight or the more simple the structure of the dyestuff, the more readily it dyes the acetate silk and the more strongly it is retained. For instance, with Magenta, which has a relatively high molecular weight, there is some difficulty in obtaining deep fast shades.

It is a well-known fact that the sulphonic or any other strongly acidic group tends to decrease the solubility of organic compounds in organic solvents such as benzene. In the same manner sulphonic acid groups appear to exert an unfavorable influence, which increases with the number of sulphonic groups present, on the affinity of the dyes for acetate silk. This unfavorable action may be more or less counteracted by the presence of other groups. G. H. Frank, of the British Dyestuff Corporation, has found that the position of the sulphonic group in the dye molecule is a decided factor in its effect upon the properties of the resulting dye as regards acetate silk.

While it has been suggested that the high affinity of acetate silk for basic dyes was possibly due to its acidic character from its acetyl groups, and that its resistance to sulphonated dyes was due to the acidic character of these dyes, this theory is hardly strictly true in the latter case, as the carboxyl and nitro groups in dyestuffs do not seriously interfere with the dyeing of acetate silk.

Acetate silk has an affinity for many dyes containing amino, alkyl-amino, hydroxyl, nitro and ketonic groups. It also absorbs certain hydroxyazo dyes which contain no sulphonic groups, such as Alizarine Yellow R (paranitroanilineazosalicylic acid) and Metachrome Brown B (picramic acid azometaphenylenediamine), as well as the simple primary amino bases such as paranitroaniline, aminoazobenzene, benzidine, dichlorobenzidine, orthoanisidine, paraamidodiphenylamine, etc., which by further treatment on the fiber, such as diazotizing and developing, give a variety of very fast colors.

The difficulties encountered in applying the common dyes by the older methods soon led to investigations involving new methods of applying these dyes which early resulted in the use of swelling agents, or organic solvents, such as alcohol, in the dye bath. This was possibly the earliest special method of dyeing acetate silk, but is no longer used, as it was expensive, impractical and unsatisfactory. As almost all of the other textile fibers are turgoids—i. e., swelling to a limited extent in water—(and this property possibly enters largely into their dyeing properties), it might appear that this method would be more useful than it really proved to be. However, certain dyes were applied in this manner that had not been applied before.

The next developments in special methods were the use of various inorganic salts in the dye bath and the saponification method of dyeing, both of which will be discussed later. The Ionamines were the first class of dyestuffs developed particularly for acetate silk, and the dispersal method of dyeing, with its various modifications, is the latest commercial development. These will receive further consideration in later instalments. The one very important factor to be remembered in dyeing or otherwise treating acetate silk is that it must be handled like natural silk and not like cotton. This is particularly important in skein-dyeing yarn of fine denier, or otherwise trouble may be experienced in winding.

Scouring Acetate Silk

As in dyeing all other fibers, it is very important to give the acetate silk an even and thorough scour before attempting to either bleach or dye it. There are a number of scouring methods given by the manufacturers of acetate silk as well as by dyestuff manufacturers and others. From the foregoing data regarding the properties of Lustron and Celanese it is very evident that they may be scoured by widely different methods as regards alkalinity and temperature of the scouring bath, the Lustron being much more resistant to both than the Celanese. While the manufacturers of Celanese warn against high temperature and free alkali, the Lustron Company states that Lustron will withstand the usual natural silk boil-off and that as much as 5 per cent of soda ash may be used in fulling at temperatures below 60 deg. Cent. (140 deg. Fahr.); also that it may be mercerized with cotton in the usual mercerizing range, using caustic soda solution of 13 to 15 per cent strength at temperatures below 5 deg. Cent. (40 deg. Fahr.), without loss of its cross-dyeing properties. However, they caution that after mercerizing the caustic should be washed out with only cold water and neutralized with acetic acid, never sulphuric acid, and the acid neutralized with dilute sodium bicarbonate solution if the acetate silk is not used at once. In case the mercerizing is not done on the machine, contact with the caustic soda should not exceed forty-five seconds. The British Cellulose & Chemical Manufacturing Company recommends the following method for scouring Celanese:

Method No. 1: *For Scouring Celanese Alone.*—Scour in a bath containing 1.25 to 1.5 grams of olive oil soap and 1 c.c. of 20 per cent ammonia per liter at 80 deg.

(*Continued on page* 237)

The Testing of Colors

Importance of Fastness Tests—The Washing Test—The Paraffine Test—Requirements for a Fastness Test—Fastness to Light—Fast to Rubbing—Fastness to Alkali—Other Tests for Fastness

By ISMAR GINSBERG, B. Sc., Chem. Eng.

THE textile manufacturer and the dyestuff maker have a particular duty to perform for the general public in carefully testing the colors that they use and manufacture. It is evident that the average person who buys fabrics for making into clothes or else purchases ready-made clothing takes it for granted that the colors which have been dyed into or printed on these fabrics are possessed of a satisfactory degree of fastness to all the influences which come in contact with them and have the power of destroying the color substance in one way or another. The dyer and the dye maker must therefore possess the proper methods for testing the fastness of dyed materials under various conditions.

The literature is full of information on the methods employed in recognizing the color on the textile fabric and testing the dyed material for its resistance to light, washing and the like. The testing of the colors that were used before the advent of synthetic dyestuffs was fairly simple, for the natural colors were rather few; but when the manufacture of coloring matters by synthetic processes commenced and thereafter rapidly developed, the problem became one of much greater difficulty. The great multitude of dyestuffs that were thus developed made it very hard to know which to select for any given purpose so that the best results could be obtained. Furthermore, the determination of the fastness of the color on the dyed fabric became of much greater importance because of the variant properties of these coloring matters and the danger of using a dyestuff that was not suitable for a given purpose.

Not only is it important to be able to determine the degree of fastness of the color dyed or printed on the textile fabric, but it is also perhaps of equal importance to be able to identify the dyestuffs themselves that were used for this purpose. The latter task is, of course, a much more complicated and difficult undertaking. Under certain conditions it is impossible to distinguish between the dyestuffs used, but it is possible at times to arrive at a very good idea of the character of the coloring matter employed by the dyer.

The Washing Test

The best method for determining the fastness of a dyed fabric is to wash it. For example, in the case of dyed cotton fabrics this test will tell at once whether the common non-fast dyestuffs of the basic and benzidine series have been used for coloring the cloth. One essential point in this method of testing is that it is carried out along the same lines as goods commonly washed in the home or the laundry. Such a test made on cotton fabrics will easily distinguish the fast from the non-fast colors.

However, differences are observed when testing the fastness of basic and direct cotton colors on bleached cotton and on wool. Right at the beginning of the washing process it will be seen that the basic colors dye the wool fiber only and that the bleached cotton remains pure white. Just the opposite takes place in the case of the direct cotton coloring matters. The colors bleed very strongly on the washed bleached cotton while the white woolen material that is washed along with the dyed goods remains perfectly white.

The Paraffine Test

After the difference has been established between the fast and non-fast colors, it remains to distinguish between the various kinds of fast coloring matters. This is a much more difficult task. The paraffine test is perhaps the most reliable for this purpose. The various dyestuffs are fused in admixture with paraffine. The test is carried out by heating a piece of the dyed thread, which has been dipped into paraffine, in a small narrow closed glass tube and observing the change that takes place in the color.

The piece of dyed thread that is employed in the test is from one to two centimeters long. This thread is placed in the lower part of the melting-point-determination tube, the upper part of which remains free and open. The object of first dipping the thread in molten paraffine is to retain the volatilized dyestuff. The paraffine is allowed to congeal on the fibers before they are placed in the tube.

In heating the threads the dyestuff is volatilized, absorbed by the paraffine, which softens and melts, flowing into the end of the tube. This molten mass will then retain the color of the dyestuff.

It is more advisable to use a larger tube about seven centimeters long and two to three centimeters wide. The length of the threads must be somewhat greater than that of the tube, so that it is possible to draw them out of the tube about one to two centimeters during the heating operation. Then again the threads should be moved back and forth while the heating is going on so as to collect all the paraffine at the bottom of the tube.

A Bunson burner, turned down half-way, is used in the test, the heating being carefully conducted at the tip of the flame.

For further details on this test the reader is referred to Der Textilchemiker und Colorist, December, 1921.

Thus when indigo and indigoid colors and also when azo colors have been used in dyeing the fabric, the paraffine becomes colored, while in the case of all the other fast colors, the paraffine does not color. It is possible in this way to distinguish between Indigo vat dyes, Indanthrene, Helindon, Algol, Anthra, Hydron, Thioindigo and Ciba dyestuffs, as well as Paranitraniline Red, Naphthylamine Bordeaux, Diansidine Blue and the Griesheim naphthols, from colors produced with sulphur dyes, alizarine and anthracene dyes, Catechu Brown, Logwood Black, Aniline Black and various mineral colors. Furthermore, both the basic and the Benzidine coloring matters do not possess the property of coloring the paraffine. Hence it is evident that the paraffine test is of the highest importance in this connection.

It just remains to distinguish between the sulphur colors and the various individual coloring matters such as Turkey Red, Aniline Black, anthracene and alizarine colors, Catechu Brown, etc., on the one hand, and between the vat dyestuffs and the azo colors prepared directly on the fiber on the other hand. It is well known that there are a large number of reactions that can be employed for this purpose, but it is possible to facilitate the testing and eliminate errors by selecting those not subject to disturbing influences. Thus the use of single reactions by which to determine the dyestuff is of little value, as the chances of making an error and arriving at the wrong conclusion are too great. It is better first to determine to what large group the dyestuff belongs and then to establish its position in that group by means of individual characterizing reactions. Then again it is often possible for the practical dyer to avoid using these special reactions to identify the dye and match the color, for his experience along these lines and the use of color cards enable him to make his selection without any difficulty.

It is, of course, just as important if not more so to determine the fastness of the dyestuff as it is to identify it on the textile fiber. Many textile and dye technologists have busied themselves with this problem, and at the present time there is available a series of simple testing methods for determining the fastness of the dyestuff to various influences, which methods give reliable and effective results. After all, the fastness of a dyestuff is a property in which most anyone who deals with dyestuffs or textiles is vitally interesting.

What Is Required for a Fastness Test

It follows that most anyone who is concerned with dyes and the dyeing of textile fabrics may be called upon at some time to test the dye for fastness. The next question is what kind of apparatus and how much apparatus is required. Is it a difficult and expensive operation to carry out or cannot it be performed simply and economically and with accuracy? Our answer is that it is not as difficult a matter as it might first appear, and furthermore the apparatus required is of the simplest kind. Then, again, only a few pieces of apparatus are necessary.

For example, in small laboratories, where only a few tests are made each day, all that is necessary is a half dozen test tubes, a few beakers, a small porcelain casserole with a handle, a glass rod and some filter paper. Fastness to alkali and to acid is tested for in the test tubes, fastness to water and to rain in the beakers, and fastness to washing in the casserole. The chemicals required include soap, soda, sal ammoniac, hydrochloric acid, acetic acid, etc.

In carrying out the tests it is advisable to compare the results obtained with standards which are made by dyeing pieces of fabrics with dyestuffs that have been found to possess the requisite degree of fastness when subjected to acid, alkalies, washing and the like. Each test will, therefore, be carried out on a sample of cloth dyed with the dye under investigation and then compared with the standard dyed samples which are put through the same test. It is therefore possible in this manner to arrive at an idea of the degree of fastness possessed by the dyestuffs being examined.

Fastness to Light

A piece of paper is dyed with the dyestuff under examination and one-half of the colored paper is subjected to the influence of light and the other half is covered. The time consumed in this test varies according to the fastness of the dyestuff, sometimes lasting for weeks and months. An important consideration is the character of the light, whether it comes from a window on the south side of the room or otherwise. It does make quite a difference. Furthermore consideration must be taken of the time of the year at which the tests are made and also of the different weather conditions during the time that the test is in progress. In fact, this is a test which must be carried out under carefully defined conditions in order that comparable results may be obtained. The sunlight in the springtime seems to have the most potent effect on the color. The ultraviolet and arc lights have shortened this test considerably.

It is common to call dyestuffs fast to light that resist the effect of the sun on the south side of the room in which the test is made for a period of four weeks. It is generally possible to tell something about the fastness of the dyestuff to light within eight days after the test has been started. If the color will fade thereafter, it will have commenced to change color by that time. It is held that dyestuffs which are used for dyeing such materials as curtain cloths, portieres, upholstery fabrics and the like must be able to withstand the action of sunlight for a period of three months in order to be considered proper for this purpose. It is suggested that when a certain color is being matched and the determinant factor is the resistance to light, the two colors, the new and the old, be subjected to a test of the above character in order to determine whether the substitute possesses fastness to light equal to the original color. Of course, it is of prime importance in all cases that the depth of the color, that is,

the shade of concentration, be alike; otherwise comparable results cannot be obtained.

Fastness to Rubbing

The fastness of a coloring matter to rubbing is an important property, but in itself it does not give any conclusive information as to the actual fastness of the dye. Fastness to rubbing simply refers to the degree of ease or of difficulty with which the color can be removed from the dyed fabric by simply rubbing it with a white cloth or piece of paper. It thus determines whether or not the dye will rub off the fabric on coming in contact with other surfaces. Some dyestuffs may be quite fast to other influences but will not stand up against the rubbing test. Among these may be mentioned Indigo Blue and Turkey Red when dyed on cotton. Then again certain dyestuffs of the benzidine series are very fast to rubbing but not at all fast to other influences. Hence it is advisable to consider the results of the rubbing test by themselves and not in conjunction with any other test. If a dye is fast to rubbing, it is recommended for dyeing clothing, gloves, lining and the like, provided it passes the other fastness requirements in the proper way.

The test is carried out quite simply. A piece of white cloth or white paper is rubbed over the surface of the dyed fabric a certain set number of times, generally twelve times up and down. The amount of color that comes off on the white cloth tells just how fast the dye is to rubbing. It is generally customary to make this test with the known dyed cloth which it is desired to match and a piece of cloth dyed with the substituting dye. In this manner a direct comparison may be made.

Fastness to Alkali

This is an important test, for all fabrics become dirty at one time or another with dust and dirt from streets and other sources which are generally strongly alkaline in reaction. Furthermore, in washing with soap, which always hydrolyzes to form a strong alkali when brought in contact with water, the fabric not only has to stand up against the ordinary action of the soap in removing dirt but also against the alkali reaction of the soap solution. The test is important for cloth that is to be manufactured into clothing both for men and women, and also for textiles that are to be made into portieres, upholstery, tapestry and rugs, covers, and the like.

The test is made in the following manner: A sample of the cloth dyed with the coloring matter under examination is placed in a 10 per cent solution of sodium carbonate, which has been mixed with half the amount of a solution of sal ammoniac. The samples are allowed to remain in this solution for fifteen minutes and then the excess alkali is squeezed out and the samples are allowed to dry without first being washed. In order that the dyestuff may be considered fast to alkali there must not have been any change in the color as a result of this treatment.

Fastness to Acids

The fastness of a coloring matter to acids is important from several standpoints. In the first place, the fabric may be subjected to rain, snow and hail, which when first falling contain a certain amount of acid. Then again the fabric may be of composite character—that is, half wool and half cotton—and has to be dyed in two stages. If acid dyestuffs are used in the second stage, it is evident that the coloring matters used in the first part of the process must be able to resist acids.

The test is made by dipping the sample of goods for ten minutes in a solution that is made by mixing one part of hydrochloric acid with ten parts of water. The excess acid solution is pressed out of the sample and the latter dried in air. In determining whether or not the color that is dyed on the cotton fabric will run when it comes in contact with an acid solution, a sample of dyed cotton cloth is entwined with a hank of white woolen yarn and the two together are put into an acid bath. This bath is composed of one gram of sulphuric acid and two and one-half grams of sodium sulphate in the form of Glauber salt to the liter. The dyestuff is concluded to be suitable for mixed fabrics when the woolen yarn is found not to be colored by it.

Other Tests for Fastness

There are still quite a few tests that are made for fastness when the fabric is used for special purposes. Thus the fabrics to be manufactured into tires and rubber merchandise must be proven fast to vulcanization. Those that are to be mercerized must be tested for their reaction toward the mercerizing reagents. Fastness to fulling is a test applied to woolen materials. Fastness to bucking, that is, toward boiling soda solutions, is also an important test. Other tests are for fastness to formaldehyde, to rubber and metals, to storage, to gas, to sulphur, to chlorine, to plain water. Each of these tests has a special significance in determining whether the dyestuff is possessed of the proper qualities to be used for the specific purpose.

It may thus be seen that the testing of a dyestuff for fastness is one of the principal tests to which it should and must be put, if correct use is to be obtained with it. In conclusion, the writer wishes to acknowledge his indebtedness to Zaenker and Rettberg's comprehensive work on this subject.

According to report, H. R. Mallinson & Co., Inc., silk manufacturers, with extensive plants in New York and Pennsylvania, have bought a cotton goods mill in the South, but no details of the transaction are available at the present time.

Highs and Lows in a Busy Chemist's Life Part II

The Science of Analysis and the Art of Testing—A Shear Oil and an Ammoniated Compound

IT is funny how smoothly volumetric went in the quantitative laboratory at school, and how differently it went in practical use. Without anybody to ask, there appear to be numerous things that have to be discovered all over again, and there is as much work in mastering some determinations as in a graduating thesis.

An analysis of caustic soda for the per cent of carbonate persisted in coming a little bit off, and quite variable. Finally I noticed a scum form rapidly over the top when my head was down near the reaction mixture of barium chloride in the aliquot of caustic soda solution, as I watched the tip of the burette to regulate the flow of hydrochloric acid. Just as two and two make four, so carbon dioxide and barium hydroxide make carbonate and there was the source of error, corrected by keeping the breath from the neighborhood of the dish, and limiting the duration of the titration to a standard few minutes.

Volumetric analysis is rather remarkable, when one realizes that all the ordinary acids and alkalies, oxidizing and reducing agents, as well as many salts, can be referred back to a single solution of standard hydrochloric acid, either directly or through some intermediate solution.

We were supposed to analyze everything that could be analyzed, for the general manager of the mills wanted to be able to say that every thing was tested, for psychological effect. That policy is all right if one wants to pay for it. Testing soda ash is quite essential in a glass factory, but analysis of 98 per cent soda, bought from one who makes it, will not earn any dividends for a textile mill or a raise of pay for its chemist.

Analysis recalls many interesting things and usually the simplest and easiest amounted to most. One mill was using sodium thiosulphate as an antichlor while a neighboring plant was buying some kind of "antichlorine" at a fancy price. A look told what it was, but the conclusion was confirmed by qualitative tests. However, they could not be convinced, for their bleacher apparently made them think that this material was "different" and had some unusual virtue, until the top coat of paint became weathered off the head of one of the empty barrels in the mill yard and disclosed the inscription, "Hyposulphite of Soda, ——— Chemical Co." After that they did feel convinced and bought from the original source at half the old price.

We analyzed (at least, that is, what we called it) various finishing pastes, etc., but found it usually a fruitless task when we tried to go much beyond the determination of water. That was usually high enough to "queer" them, anyway. One little experiment that took about ten minutes amounted to more than all the hours spent on the analysis put together.

Someone heard that ammonium stearate was used as a softener. Could we make some? Sure; and in no time we had melted a small piece of stearic acid in the top of a beaker of water, added some ammonia and stirred it up to a nice silky stearate. It was put right out in the mill and that simple little process saved enough to pay the chemist's salary.

The softener was also tried on worsted pieces to get a desired effect, but it showed white on the surface of dark shades. This had the finisher worried until I told him to run his pieces in a little ammonia; they were then promptly cleared.

A big share of the routine analysis was routine, and that is about all. Sometimes, however, it showed up something worth while like the formic acid that had been bought from a new place without submitting for a laboratory test. It "Twaddled" 75 per cent, but analyzed only 45 per cent. Tests failed to show Cl or SO_4, but on evaporation it was found loaded up with glucose. Incidentally, I believe, that was imported, too.

As usual, if everything was not tested, the things that needed it were the ones that were skipped; witness, the barrel of yellow prussiate of soda that was noticed in use in the mill getting white and powdery on the top. A close look showed crystals that were not yellow and they were found to be Glauber salt crystallized or mixed with the prussiate. Probably the sellers were merely trying to meet competition and still make a profit; but, anyway, back went the goods.

I was very soon impressed with the idea that mill men would much rather find out what somebody else was doing and then try to copy it, than to bother to try to work things out. I, being a callow chemist, was for trying to work them all out, no doubt influenced by the fact that I would do the working out, while it would be somebody else that did the finding out; and then, of course, he would get the glory, while I was merely "dubbing around the lab."

However, I finally got the other viewpoint, too, although neither way is all right or all wrong. It is, of course, no different from scientific investigation, where the attempt is made to find out all that is known about a subject before beginning to work on it, and it may save a lot of time and money. But, sponging on others is not the whole secret of progress.

I was often tempted to believe all the things that I had ever heard about dyers, finishers, etc., but some of their attempts to avoid any possible contamination by the baleful influence of the laboratory were so funny that it was difficult to take them seriously.

Some neat's-foot was bought for a shear oil. There had been a little trouble from a variation in cold test between lots, this being a factor of some importance in winter. The finisher was in favor of one oil and the laboratory of another that was of good quality and a little less expensive. Here are the arguments against the laboratory selection: It would not "stand up," meaning that too much of it had to be used; in another discussion it was so thick that it wouldn't go through the holes in the leather

on the shear. Interpreted, that means he didn't use as much as usual. Consistency, thou art a jewel.

Another interesting controversy arose over an "ammoniated compound." Assuming that it was necessary to use such an article, I could not see why we should not make it for a couple of cents, rather than pay four or five for the prepared stuff. So I devised a formula and mixed some up. I should have said that its purpose was, according to the finisher, "to evaporate the soda" after neutralizing carbonized pieces. Finally I got a chance to try my compound, which was a duplicate of the other, and contained mostly soda ash, I believe, some bicarbonate and a little ammonium chloride. At the critical point in the neutralizing process there was not quite as much smell of ammonia as the finisher thought there ought to be, apparently because he had not rinsed the goods as much as usual and the alkali had become used up. I said I could fix that all right so I put some more soda ash into the washer, and in a minute or two we had enough free ammonia for anybody.

Neither the finisher nor the superintendent, who was on the scene by that time, could understand the mystery, how one could put in soda ash and get out ammonia. At any rate, my process did not succeed in properly "evaporating the soda," so we missed saving a few dollars for the mill.

(*Part III will appear in an early issue.*)

PLANS FOR CHEMICAL COURT OF ACHIEVEMENT

Chemical products, equipment and processes, in fact, all new developments of American chemistry of the past few years, will each receive unusual recognition at the Tenth Exposition of Chemical Industries to be held this year during the week of September 28th to October 3rd at the Grand Central Palace, New York. Plans for the new "Court of Chemical Achievement," inaugurated at the recent meeting of the Advisory Committee of the Exposition, are rapidly taking shape. Outstanding achievements of American chemistry, whether in the research or industrial field, which have been completed during recent years, will be admitted to the Court after they have passed a committee of approval of the American Chemical Society.

The new "Court of Achievement," which bids fair to be the outstanding feature of the Chemical Exposition this year, will be in the form of small unit exhibits together in one large specially arranged group. Among the new products which have been suggested to be displayed and explained by members of the American Chemical Society, who will oversee the exhibits, are twenty-seven recent developments. This list will probably be increased several times by other new chemical products, instruments, and explanations of new processes.

All exhibits will be passed upon and admission to the "Court of Achievement" granted by a committee of the American Chemical Society known as the Committee of Approval, which is composed of Marston T. Bogert, chairman, C. M. Stine, E. R. Weildlein, F. W. Willard and John Johnston. A sub-committee of the Chemical Exposition Advisory Committee composed of H. E. Howe, chairman, F. J. Metzger and T. B. Wagner, will act in an advisory capacity to the exposition management in the general conduct of the new project.

Entries for new products and processes for the Court of Achievement must be sent to Court of Achievement, Room 1102, Grand Central Palace, New York, prior to May 1st, after which time applications will not be considered. A nominal fee will be charged for all exhibits in the Court except those of institutions of learning and Government bureaus or departments which will be accepted with out charge if they pass the judges. A brochure will be printed and distributed from the Court of Achievement at the exposition. Full information can be secured by inquiring to the address indicated above.

DU PONT ADOPTS "RAYON"

The Du Pont Fibersilk Company, with plants at Buffalo, N. Y., and Old Hickory, Tenn., has changed its name to the Du Pont Rayon Company. This is to conform with its recent adoption of the name "Rayon" for its product. This name has been adopted generally for products which heretofore have been known as artificial silks, the manufacturers and consumers feeling that, as this is a distinct textile of many and varied uses, it should no longer bear the burden of being regarded as an "artificial" product.

The use of rayon is increasing so rapidly that the Du Pont Rayon Company has started new construction at Old Hickory, Tenn., which, when completed, will duplicate the capacity of the plant at Buffalo. Work on the new construction was begun at about the same time that the original Old Hickory plant went into operation, and it is expected that the entire productive capacity will be available within a few months.

PIPE FLANGE CATALOG

A new catalog of Forged Steel Pipe Flanges has just been issued by the American Spiral Pipe Works, Chicago, Ill. It is handsomely printed, illustrated and bound and consists of 86 pages of classified and tabulated data on pipe flanges, forged tubular products, seamless rolled steel rings and corrugated boiler furnaces. Primarily it is a handbook of valuable information for engineers, designers and operators of power systems. It is illustrated with full-size cross sections, which, with tables and some half-tone illustrations, convey the best modern practice in the field of increasing pressures and superheat.

A small hosiery mill will locate in Huntsville, Ala., according to an announcement from the local chamber of commerce.

It is reported that a plant will be established in Madison, N. C., for the production of artificial silk by Nat M. Pickert.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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Philadelphia Section—
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Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Southern Section—
Harold M. Chase, Riverside and Dan River Cotton Mills, Danville, Va.
Harry W. Ormand, Secretary, Union Bleachery, Greenville, S. C.

FEBRUARY MEETING OF THE PHILADELPHIA SECTION

The regular February meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held in Philadelphia, Friday evening, February 13, 1925.

The meeting was preceded as usual by an informal dinner at the City Club of Philadelphia at 6.30 p. m.

The meeting was called to order by Chairman Bertolet at 8.30 p. m. in the auditorium of the Philadelphia Textile School.

After a few brief remarks by the Chairman, in which the work of this section and furthering the interest by its members were discussed, the minutes of the previous meeting were read and approved as read.

There having been no meeting of the officers and Executive Committee the question of monthly or bimonthly meetings was as yet undecided; the section will proceed with the usual monthly meetings for the present.

Mr. Bertolet then announced the personnel of the committees for the coming year as being the same as printed in the notice of the February meeting, mailed to each member.

There being no further reports of officers or new business, Mr. Bertolet then introduced David Wallace, superintendent of the American Dyewood Company, Chester, Pa., who gave a very interesting and instructive talk on the subject of "Natural Dyes—What They Are and Their Present-Day Importance." This talk was well illustrated by various samples of the natural dyewoods, products obtained from them and a number of dyed samples showing their application to textiles and other materials.

After a brief discussion of the paper, a rising vote of thanks was tendered the speaker of the evening and the meeting adjourned at 10.15 p. m.

There were about forty-five present.

PERCIVAL THEEL, Secretary.

MARCH MEETING OF THE PHILADELPHIA SECTION

The March meeting of the Philadelphia Section of the American Association of Textile Chemists and Colorists was held in Philadelphia, Friday evening, March 13, 1925.

The meeting was preceded as usual by an informal dinner at the City Club of Philadelphia at which eleven were present.

The meeting proper was called to order by Chairman Elmer C. Bertolet at 8.30 p. m. in the auditorium of the Philadelphia Textile School.

The minutes of the previous meeting were read and approved as read. Mr. Bertolet then announced that there would be a meeting of the Program Committee on the second Friday in April at 5.45 p. m., this being the date of the regular April meeting of the Section. Attention was also called to our informal dinners preceding the regular meeting, and it was requested that more of our members avail themselves of that portion of our meetings.

On behalf of the Program Committee announcement was made that at the next meeting of the section a film showing the life history of the moth, etc., would be shown; there would also be an additional paper read to the section at that time.

There being no further new business Mr. Bertolet then introduced W H. Wingate, the speaker of the evening, who read a very interesting paper on the Franklin Process of Dyeing. This paper, which is published below, was well illustrated by a number of samples of materials dyed on the Franklin machine. The paper was followed by a very interesting general discussion.

On motion of Dr. Hollander, duly seconded, a rising vote of thanks was tendered the speaker and motion of adjournment made and passed.

The meeting adjourned at 10 p. m. There were ninety-seven present.

PERCIVAL THEEL, Secretary.

The Franklin Process Method of Dyeing—A Description and Discussion

By W. H. WINGATE

Improvements and new ideas have developed in dyeing during the past few years, and one which has aroused a great deal of interest is the Franklin Process method of dyeing in the wound form, in a closed kier, under pressure. This is not a new idea for the application of color—cheese dyeing machines having been used in Europe for some years—but the Franklin method has been continuously improving and to-day is the leading method of dyeing in the wound form. This is due to the many advantages gained by the use of this method.

The yarn is wound for dyeing onto a spiral wire spring. These springs are of iron, brass or nickel and are covered with knitted stockings. The covers prevent the yarn from falling through the opening and seizing the spindle in the dyeing machine. They also prevent the yarn from coming into direct contact with the springs.

The Franklin package is usually made up with a 3 to 6 inch traverse, depending upon the size of the yarn. The finer yarns from 40/1 are usually wound on the 3-inch spring about 4 to 4¼ inches in diameter; the coarser yarns on a 6-inch spring with diameter varying from 4 to 5½ inches. The 4-inch package contains about one pound of yarn, while the 5½-inch package will contain nearly 1½ pounds. Very coarse yarns such as twine, cable cord, etc., are wound on 9-inch packages as greater yardage is obtained. Of course, any size traverse within these limits can be used, depending upon the conditions in the mill.

Very little difficulty is experienced in winding yarn in this form. The packages should be nearly of the same size—although large and small packages have been dyed in the same machine with even results. Also the packages should not be wound too hard and all should be of about the same degree of hardness. Variations do happen and this is rectified when the packages are compressed on the dye spindles, making a column of yarn about the same density.

It is interesting to note the small amount of space required for one hundred pounds of yarn on Franklin packages as compared with the space the same amount of yarn in skeins requires.

The Franklin machines are made of iron, bronze, or wood with bronze fittings, in various sizes, from those containing one pound to machines holding one thousand pounds of yarn. This large machine will also take nine hundred packages of 5½-inch diameter, making around 1,500 pounds of yarn in one batch. A special machine is now being manufactured which will dye four thousand pounds of yarn at one time. One can readily see what it means to have this amount of yarn in one shade, and the time and labor saved in dyeing this amount in one operation. Half of this yarn could be filling and the other half warp, and both the same shade.

The machines are equipped with perforated spindles and over these the packages are placed. When full they are compressed down tight and locked with a top plate. Recently new covers have been made with the top plate connected with a heavy spring to the top of the cover. When the machine is full of yarn the cover is lowered and these plates coming over each spindle compress the column. Now, on each spindle there is a uniform column of yarn which is very elastic due to the springs. The yarn may shrink or swell but the top plate keeps the column uniform. There is no danger of channeling between packages. You can see the advantage of this method over that of dyeing yarn on solid cores which allows no elasticity.

If there are not enough packages to fill all of the spindles in the machine the empty ones must be covered or plugged. In no case is a spindle allowed to remain empty or partly filled with yarn, as the dye solution would flow through these openings instead of through the packages.

When the machine is full the cover is bolted down and the yarn boiled out in the regular way. In some cases, as with certain direct shades and sulphur blacks, a boil-out is not necessary.

The dye is dissolved and strained into the expansion tank. We have obtained the best results by stopping the machine while the dye solution is being added. When starting it is advisable to have the circulation from outside to inside. This means that the pump forces the dye solution up through the perforated spindles. This is a positive action and the dye solution is forced through the columns of yarn.

There is a two-way circulation and this is controlled by a four-way valve. There is only one valve to change during the dyeing operation and this can be shifted as desired. At the start of the dyeing it is good policy to shift often, but after the dye has run for a short time it is not necessary. Our best results are obtained by favoring the outside to inside circulation—ten minutes on

outside and three to five minutes on inside works well. It might be of interest to say that dyeings have been made and even results obtained by allowing the circulation to remain on the outside during the entire period.

An overflow pipe in the top of the machine allows air to leave or enter when filling or emptying. By watching the flow from this pipe a good idea of the condition of the dye bath can be obtained.

Samples are easily taken during the dyeing by means of a quick opening cover in the cover of the machine. Small skeins are tied around the top package under this opening with a few strands of cotton. A string is tied to one end of the skein, the other end passing out through the cover. A sample can be easily removed by stopping the machine for an instant. As this skein is around a package, it is dyed the same as the batch.

If additions are required, they can easily be made by adding the dissolved color to the liquor in the expansion tank. In some cases the bath is cooled down, while in others they are made at the boil. All depends upon the shade and dyestuff used.

All classes of soluble dyestuffs are dyed, and I will outline briefly our method of handling them.

The machine is especially adapted for the dyeing of vat colors. The dyes are reduced before entering and allowed to run for about one hour. The amount of hydrosulphite and caustic used is less than when dyeing in an open tub, as there is very little oxidation in the machine. Oxidation takes place immediately after the dye is run away. Machines are now equipped with vacuum pumps, and oxidation is produced by sucking air through the packages. If there is no pump, oxidation is produced with chemicals such as perborate or peroxide of sodium. Either gives good results. The dyeings are then given a boiling soap bath and rinsed.

It is interesting to mention that basic colors are successfully dyed in an iron machine. When bottoming with tannic acid the percentage used must be reduced, due to the short volume of liquor. Heavy shades only require 2 to 3 per cent of tannic acid, while for light shades 1 to 1½ per cent is sufficient. The tannic bath is allowed to run for about three hours at 160 deg. Fahr. The tartar emetic bath is also cut in proportion. The dyeing is done in the usual way.

Direct and sulphur dyes require very little attention. In most all cases formulas can be cut 15 to 25 per cent from methods employing the longer bath. The dye is entered and the bath raised immediately to the boil. After boiling for a short time salt is added to exhaust the bath.

When dyeing developed shades the diazotizing bath should be reduced to about 2 to 3 per cent nitrate of soda and 3 per cent sulphuric acid.

We have been bleaching in an iron kier for the past year and the results are very successful. The entire operation is carried out without handling the yarn from the time it enters the machine until it is taken out. Either the lime or the peroxide bleach can be used. At present we are using the peroxide bleach and have a production of fifteen hundred pounds per day from one 420-package machine—two bleaches of 750 each being taken out.

After dyeing, the packages are unloaded and extracted in hydroextractors. They are then placed in trays and left in the driers from eight to ten hours.

The yarn can be used direct from the package by placing a wooden arbor inside the spring. It can be taken off by rotating the package or over end. Franklin packages can be used anywhere that any parallel tube or spool of yarn is used.

Worsted yarn is dyed either in the package or jackspool machines. The fine single-ply yarns are best handled by the package method while the two-play are usually dyed on jackspools. These machines are operated in the same manner as the package machines. The yarn is wound onto a perforated aluminum tube with wide flanges in each end. Either 40 or 48 ends are placed on a spool and each spool placed on a separate spindle in the machine. These machines run up to 500-pound capacity.

Worsted yarn can be dyed by any of the various methods. A proper selection of colors should be made and dyed in the same manner as any worsted dyeing. The spools are dried by blowing hot air through them.

A large percentage of fancy worsted mills are equipped with the Franklin Process Method of dyeing.

Top Dyeing

In the Franklin top dyeing machines the spindles are set further apart than in the package machines. The tops, wound on springs, are loaded into the machine in the same manner as the packages, and compressed with a top plate and pin. The dye liquor is forced through and the tops are not torn or distorted. After dyeing, the tops are removed and dried and are ready for the next operation.

Franklin Raw Stock Machine

The new raw stock machines are gaining quite a reputation for the saving in labor and the condition of the stock after dyeing.

The stock is easily loaded in the machines and the dye liquor is forced down through it, under pressure. This is a one-way circulation and the stock does not move during the dyeing. As the kier is closed, there is very little steam or moisture around the room.

The machines are easily unloaded as they are equipped with a movable bottom, and the stock is lifted from the machine in one solid mass by means of an electric hoist.

The stock does not felt and is left in a very open condition for spinning. One mill has five thousand pounds daily.

Now just a few words about the advantages of the process.

The dyehouse is free of steam as very little escapes from the closed kier. The floors are dry and there is very little odor around the room. Nearly everyone that goes through out dyehouse remarks on the condition of it.

The yarn is in compact form and requires less floor space either for dyeing or storage before dyeing than any other system. A thousand-pound machine requires a floor space of 10 by 12 feet. We have taken out of one machine 6,800 pounds of yarn in eleven hours. These were four lots of a direct shade, each lot weighing about 1,700 pounds.

The labor cost is very low because it is easy to operate the machine, no skilled labor being required. One man can operate two or three machines, and in rush periods assistance can be given him when loading and unloading.

The Franklyn dye bath is a very short one, as it is in the proportion of one pound of yarn to a gallon of water. With this short bath there is a saving of water, dye, chemicals and steam. Steam saved means coal saved.

The ability to duplicate shades is very good, as nearly everything is constant. Once a formula is established the shade usually repeats very closely.

Fine yarns dye as well as coarse ply yarns. We dye 80/1 to 120/1 yarns for many mills, also all sizes, and hard twists including heavy twine and cords.

Yarns dyed by the Franklin method are penetrated, as the dye solution flows through the yarn. Compare a cut surface of a yarn dyed in an open tub—the skeins are moved through the liquor—with Franklin dyed yarn. Note the difference in penetration of dye, depth and solidity of color.

In the various operations after dyeing there is a saving in waste, labor and time, when Franklin packages are used.

OCTOBER MEETING OF THE LOWELL JUNIOR SECTION

The first meeting of the season of the Lowell Junior Section of the American Association of Textile Chemists and Colorists was held October 30, 1924. Chairman Pierce called the meeting to order at 2.55 p. m. The reports of the secretary and treasurer were read and accepted.

Chairman Pierce welcomed the sophomore class and explained to them the benefits derived from a membership in the society.

As there was no business the speaker of the afternoon, Professor Hibbert of Yale University, was introduced. He spoke on "The Relation of Cellulose to Artificial Silk." Professor Hibbert's very interesting lecture explained the industrial development as well as the theoretical side of the industry.

Open discussion followed the lecture and at its close a rising vote of thanks was extended to Professor Hibbert.

There being no further business to come before the meeting it was voted to adjourn at 4.10 p. m.

PHILIP E. MASON, Secretary and Treasurer.

MARCH MEETING OF THE LOWELL JUNIOR SECTION

The March meeting of the Lowell Textile Junior Section of the American Association of Textile Chemists and Colorists was held March 5, 1925. Chairman Pierce called the meeting to order at 3.40 p. m.

The minutes of the last meeting were read and accepted. As there was no other business to come before the meeting the chairman introduced the speaker, Harold W. Leitch, of the chemical laboratory of the Franklin Mills. His subject was "The Dyeing of Woolen and Worsted Piece Goods with Acid Dyes."

His talk was very interesting to the Section, particularly to the seniors, who obtained information that will be of great value to them in their work after graduating from school.

Following the lecture there was a general discussion in which Mr. Leitch cleared up some difficulties which were brought out by the members of the Section.

It was then voted to give the speaker a rising vote of thanks for his kindness in addressing the Section. The meeting adjourned at 5.15 p. m.

PHILIP E. MASON, Secretary and Treasurer.

MARCH MEETING OF THE RHODE ISLAND SECTION

The Rhode Island Section of the American Association of Textile Chemists and Colorists held a joint meeting with the Rhode Island Section of the American Chemical Society on March 17, 1925, at the Jesse Metcalf Chemical Laboratory, Brown University. Frederick Bliss presided and called the meeting to order at 8.15.

The speaker was Thomas Midgley, Jr., vice-president and general manager of the Ethyl Gasoline Corporation, 25 Broadway, New York City. The subject was "Anti-Knock for Automobiles." Mr. Midgley, a mechanical engineer and a graduate of Cornell University, gave a most delightful and absorbing discourse. It was very entertaining to hear the history of the long search for an anti-knock compound for automobiles from one who took part in the important research work.

After the lecture there followed a general discussion which showed the keen interest of the audience. A rising vote of thanks was given to the speaker.

No business of the Rhode Island Section of the American Association of Textile Chemists and Colorists was transacted at this meeting.

Adjournment was at 9.45 p. m.

ALBRO N. DANA, Secretary.

SUPPLEMENTARY REPORT

Committee Group W—Fastness Tests for Dyed Wool

[*The following supplementary report has been submitted by Sub-Committee Chairman William D. Livermore, American Woolen Company, Shawsheen Village, Andover, Mass. It should be substituted for the paragraph headed "Group W-I" at the top of page 60 of the 1924 Year Book.*]

GROUP W-I—TESTING OF FASTNESS TO WASHING OR LAUNDERING OF DYED WOOLEN MATERIAL

Method of Test

Make up a solution of 1 part dry neutral soap to 200 parts water. Wet carefully the material to be tested in this solution, remove and pass through a wringer and return to the solution. Keep in the solution for the time given for the test and at a temperature of 120 deg. Fahr.

Remove, wring, pass through soap, wring, rinse very carefully, wring and dry.

When it is possible to provide the material for the braids of dyed material, white cotton, white wool and white silk, as given for the fulling tests, it is desirable that this should be done and that two separate tests should be made—soaking one braid for thirty minutes, and another for four hours.

When the material is very limited the test material can be observed after thirty minutes, and if practically unchanged the test can be continued to four hours.

Classification of Tests

(a) In respect to alteration in color of the material.

Class 1.—No alteration in character of shade and less than 5 per cent loss in depth with a 4-hour test. Loss should be imperceptible or nearly so.

Examples: Erio Chrome Azurol B, Alizarine Blue Black B, Anthracene Brown SW.

All the true chrome or mordant wool colors tested fell in this class.

Class 2.—Colors which show perceptible loss in four hours at 120 deg. Fahr., but do not lose 20 per cent in depth and do not change in character.

Examples: Wool Violet 4BN, Alizarine Cyanine Green G Ex, Diamine Green B, Chrysophenine, Fast Wool Cyanine 3R, Sulphon Cyanine 5R Ex. Anthracene Red (S 355).

Class 3.—Colors which lose 20 per cent or more in four hours' test at 120 deg. Fahr., but hold their character and will stand 30 minutes' test at 120 deg. Fahr. with less than 20 per cent loss.

Examples: Fast Red A, Alizarine Sky Blue B.

Class 4.—Colors losing 20 per cent or more in 30 minutes' test at 120 deg. Fahr.

Examples: Alizarine Blue SAP (dyed sour), Indigotine, Acid Phloxine 2G, Acid Magenta.

(b) With respect to staining fibers in contact with the dyed material.

Class 1.—Do not stain wool, cotton or silk in 4 hours' test. Includes nearly all chrome colors when properly dyed. Picramic Acid Browns serve as an exception tending to stain silk.

Examples of colors not mordant dyes, but which do not stain in 4 hours' test: Wool Violet 4BN, Alizarine Cyanine Green G, Tartrazine (Class 3 in regard to loss of depth).

Classes 2, 3, 4.—

I. Wool.—Class 2 stains in 4 hours' test but not in 30 minutes' test. Example: Patent Blue A. Class 3 stains in 30 minutes' test. Example: Fast Red A.

II. Silk.—Class 2 stains in 4 hours' test but not in 30 minutes' test. Example: Alizarine Blue SAP (dyed sour). Class 3 stains in 30 minutes' test. Example: Fast Red A.

III. Cotton.—Class 2 stains in 4 hours' test, not in 30 minutes' test. Example: Sulphon Acid Blue R. Class 3 stains in 30 minutes' test. Examples: Chrysophenine, Fast Red A, Cloth Red B.

It must be noted that many colors included in Class 3 for cotton, such as Chrysophenine, are entirely suitable and may even fall in Class 2 for use where no white cotton is present.

The whole subject of staining in any particular case must be treated from the point of view of what is reasonable to expect of a particular fabric, in view of the sort and amount of laundering to which it is normally subject.

Shades Made from More Than One Dyestuff

A number of these shades have been made up combining two dyestuffs of the same class and also two dyestuffs of the several possible combinations of classes.

Two dyestuffs of the same class acted approximately as a single dyestuff of that class, and did not change character of shade radically.

Where two dyes were combined that were of different class and the tests were applied, each dyestuff followed its own class, and the result was a marked and sometimes radical change in character of shade.

Whenever a fabric shows definite change in character under the 30 minutes' test it must be regarded as in Class 4.

Similarly, if a color shows change in character in the 4 hours' test, but not in the 30 minutes' test, it must be regarded as in Class 3.

To be regarded as in either Class 1 or 2, a color should not show such change in character of shade as to indi-

cate that one component of the color has been washed out materially more than others, except in Class 2 such change is permissible as might be occasioned by a 10 to 15 per cent loss in one or more of the components. This is based on the ground that while this loss may be visible in a 4-hour test, it would probably not be noticeable even after repeated careful laundering.

Conclusions

Colors of Class 1 are suitable for all normal requirements for repeated laundering or washing, and will generally stand severe usage without deteriorating.

Colors in Class 2.—These colors include the best class of bright or decorative colors. They should be acceptable for all ordinary requirements of repeated careful laundering or washing, but should not be expected to stand exceptionally severe treatment, and particularly should not be subjected even for a short time to high temperatures—temperatures, for instance, too high to be bearable to the hand, or for example above 130 deg. Fahr.

Colors in Class 3.—These colors are suitable for occasional and careful washing, but the temperature must be kept below 100 deg. Fahr.

Colors in Class 4.—These colors may sometimes be carefully washed or laundered, but no guarantee or assurance can be given in regard to them.

The foregoing classification is also subject in fancy fabrics to the requirements that the colors must not stain any fiber which may be part of the fabric when washed or laundered in a manner suitable to the goods.

To be regarded as first class, the color must stand the 4-hour test without staining any fiber present in the fabric, or any fiber with which it may be washed.

To be regarded as of the second class, the color must stand the 30 minutes' test without staining any fiber present in the fabric.

The third class, in this respect, may include colors suitable for careful washing below 100 deg. Fahr., but no guarantee can be given.

TWENTY-SEVENTH RESEARCH COMMITTEE MEETING

The twenty-seventh meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineer's Club, Boston, Mass., on March 7, 1925.

The following members were in attendance: L. A. Olney, A. E. Hirst, W. S. Williams, J. F. Bannan, E. H. Killheffer, W. C. Durfee, G. A. Moran, W. D. Appel, W. H. Cady, W. R. Moorhouse, W. D. Livermore, W. K. Robbins, R. F. Culver, P. J. Wood, H. Christison, H. W. Leitch, W. J. Murray, W. E. Hadley.

The committee in charge of the determination of the standard to be used in fastness of textile material to light, felt that it might be well to change the standardization from a time basis to that of some standard fading unit, the basic idea being to use certain dyes, or combination of dyes, upon different materials, the fading of which could be sharply defined and thus be used as standards.

W. J. Murray, W. S. Williams and A. E. Hirst were appointed a committee to formulate methods for Fastness to Hot Pressing.

Wm. D. Livermore is to formulate trials covering Sponging.

Wm. K. Robbins was designated to look up the fastness of Textile Material to Salt Water.

H. W. Leitch and W. K. Robbins were designated a committee to formulate trials for Fastness to Carbonizing.

Respectfully submitted,

W. E. Hadley, Secretary.

TWENTY-NINTH COUNCIL MEETING

The twenty-ninth meeting of the Council was held at the Engineers' Club, Boston, Mass., on Saturday, March 7, 1925. The following members were present: L. A. Olney, A. E. Hirst, W. S. Williams, J. F. Bannan, E. H. Killheffer, W. C. Durfee, G. A. Moran, W. R. Moorhouse, W. D. Livermore, W. K. Robbins, R. F. Culver, W. E. Hadley.

The following applicants were admitted to membership:

Active Members

Arnold, Henry D., dye demonstrator, 113 High Street, Boston, Mass. 28 Orchard Avenue, Waban, Mass.

Benger, Ernest B., chemist, du Pont Fibersilk Company, Station B, Buffalo, N. Y.

Bengs, Carl, silk dyer, Cheney Bros. Co., South Manchester, Conn. 121 Park Street, South Manchester, Conn.

Booth, Herbert, demonstrator, Arabol Manufacturing Company, New York, N. Y.

Brainerd, W. E., chemical engineer, Rollins Hosiery Mills, Des Moines, Iowa.

Carr, William T., assistant dyer, Lincoln Bleachery & Dye Works, Lonsdale, R. I. 160 Main Street, Lonsdale, R. I.

Dempsey, John C. H., demonstrator, Geigy Company, Philadelphia, Pa. 6523 N. Uber Street, Philadelphia, Pa.

Esterly, William A., production supervisor, Vanity Fair Silk Mills, Reading, Pa.

Fischer, Henry F., colorist, E. I. du Pont de Nemours & Co., Wilmington, Del. 18 Railroad Avenue, Penns Grove, N. J.

Forster, Conrad, textile chemist, Dedham Finishing Company. 117 Cedar Street, E. Dedham, Mass.

Gamble, Edward H., textile chemist, E. I. du Pont de Nemours & Co., Wilmington, Del. 162 First Street, Carney's Point, N. J.

Hall, C. Edward, assistant dyer, Belleville Dye Works, 56 Van Houten Place, Belleville, N. J.

Haworth, Richard, president and treasurer, Richard Haworth, Inc. Box 497, Providence, R. I.

Hoffner, Joseph P., president, Hoffner Silk Dyeing Company, 2427 North Fourth Street, Philadelphia, Pa.

Hopkins, Edward R., chemist, Rentrop Silk Dyeing Corporation, 109 Raymond Street, Brooklyn, N. Y.

Jardine, William, colorist, Manhattan Print Works, 185 Hamilton Avenue, Clifton, N. J.

Kuhl, Herbert, demonstrator and salesman, Carbic Color Chemical Company, Providence, R. I.

Landau, Alfred K., textile manufacturer, Berthadale Mills, 333 Easton Street, McComb, Miss.

Martin, H. W., manager, Kuttroff Pickhardt & Co., P. O. Box 1391, Philadelphia, Pa.

McKenzie, A. H., superintendent of dyeing, Hanover Woolen Manufacturing Company. Box 80, Hanover, Ill.

McNab, William S., sales manager, Quaker City Chemical Company, Philadelphia, Pa. 2738 N. Broad Street, Philadelphia, Pa.

Nash, W. F., textile chemist, du Pont, 63 Second Street, Carney's Point, N. J.

Nelson, Thomas, professor of textiles, North Carolina State College, State College Station, Raleigh, N. C.

Plucker, Julius, Jr., superintendent, Sunbury Converting Works, Sunbury, Pa.

Stehle, Richard B., dyer, Brehm & Stehle, Philadelphia, Pa. 5010 Penn Street, Frankford, Philadelphia, Pa.

Steller, John J., ceretary and general superintendent, Sunbury Converting Works, Sunbury, Pa.

Stiegler, Dr. Harold W., research and instructor, Lowell Textile School, 535 Howard Street, Lawrence, Mass.

Volkman, Edward J., Jr., chemist, Davis & Quick. 1059 Eighty-first Street, Brooklyn, N. Y.

Walker, Chas. P., chemist and demonstrator, Grasselli Dyestuff Corporation. Box 79, Charlotte, N. C.

Wallace, David G., Southern manager, Geigy Company. Box 622, Columbus, Ga.

Junior Members

Brooks, Clyde, overseer of bleaching and finishing, Kerr Bleaching & Finishing Works. 64 Grove Street, Concord, N. C.

Buthmann, Edwin A., assistant dyer, Wood Worsted Mills, Lawrence, Mass. 41 Kingston Street, Lawrence, Mass.

Dawson, John, Jr., laboratory assistant, American Printing Company. 174 Walker Street, Fall River, Mass.

Glickman, Bernhardt, student, Lowell Textile School, Lowell, Mass. 643 Morton Street, Mattapan, Mass

Graziano, Daniel J., textile colorist, Calco Chemical Company. 49 Van Kuren Avenue, Bound Brook, N. J.

Johann, Albert F., textile colorist, Newport Chemical Works, Passaic, N. J. 118 Washington Place, Hasbrouck Heights, N. J.

Kamena, John L., colorist, Grasselli Dyestuff Corporation, New York, N. Y.

Levering, John A., wool scouring and carbonizing, Evenson & Levering Company, Camden, N. J.

Musgrave, George W., student, Lowell Textile School, 52 Mt. Washington Street, Lowell, Mass.

Paradis, Joseph L., student, New Bedford Textile School, 542 County Street, New Bedford, Mass.

Philips, Thomas, assistant dyer, Wood Worsted Mills. 21 Pleasant Terrace, Lawrence, Mass.

Prevost, Francis H., dyer, H. C. Townsend Cotton Mill. 1420 Tribble Street, Anderson, S. C.

Schofield, G. Heber, salesman, Geigy Company. 476 Martin Street, Roxborough, Philadelphia, Pa.

Searell, George W., second hand of silk degumming, National Spun Silk Company, Bullard Street, New Bedford, Mass. 42 Ocean Street, New Bedford, Mass.

Shane, Nat C., Jr., dyer, National Silk Dyeing Company, Dundee Lake, N. J. 24 Jane Street, Paterson, N. J.

Smith, William C., student, Lowell Textile School. 298 Pawtucket Street, Lowell, Mass.

Tanguay, Gerard, student, Lowell Textile School. 28 Mt. Washington Street, Lowell, Mass.

Tessier, Victor F., assistant dyer Worcester Woolen Mill Company. 137 Beacon Street, Worcester, Mass.

Vellner, Frank A., textile chemist. 354 E. Eleanor Street, Philadelphia, Pa.

Joseph Bancroft & Sons Company, Wilmington, Del., were elected to corporate membership in the Association. John MacAdam and Donald S. Ashbrook were designated as representatives.

A. R. Thompson, Jr., connected with Rohm & Haas Company, Inc., Charlotte, N. C. office, was transferred from Junior to Active Membership.

Plans were discussed as to the best method to be employed in securing funds for extending the work of the Research Committee.

It was decided to send out questionnaires in the near future covering such data as will be required for the 1925 Year Book which will be published about the middle of the year, active plans for which are now being made.

In view of the very cordial invitation extended by the

Northern New England Section of the Association, the Council voted unanimously to hold the 1925 Annual Meeting in Boston during the early part of next December.

It was voted to hold the next Council Meeting at the Chemists' Club, New York City, on April 11, 1925, consideration being given to the fact that the American Chemical Society meeting in Baltimore would attract many of the Council Members at that time. This arrangement is in accord with vote taken at the Council Meeting in Philadelphia in December, 1924, that at least two Council Meetings would be held each year in New York or Philadelphia.

Respectfully submitted,

W. E. HADLEY, Secretary.

Applicants for Membership

Active Membership

Clark, Elizabeth A., superintendent of finishing and dyeing, The Scranton Lace Company, Scranton, Pa. Sponsors: W. E. Mitchell and C. A. Puller.

Cowburn, R., superintendent of finishing, Malboro Cotton Mills, McCall, S. C. Sponsors: H. L. Seiver and H. W. Ormand.

Hager, Dr. Herman E., manager, technical department, The Grasselli Dyestuff Company, New York City, N. Y. Sponsors: E. A. F. Zillessen and Edw. F. L. Lotte.

Kershaw, Jas. W., overseer of dyeing, Standard Bleachery Company, Passaic, N. J. Sponsors: Dr. S. F. Carter and Dr. Alfred Pfister.

Landers, Bernard, chemical engineer, 170 Summer Street, Boston, Mass. Sponsors: H. P. Selya and A. A. Claflin.

Mitchell, Burton F., superintendent, processing plant, Mount Holly, N. C. Sponsors: H. L. Seiver and H. W. Ormand.

Moss, Clarence E., Philadelphia manager and demonstrator, Portsmouth Dye & Chemical Company, Philadelphia, Pa. Sponsors: D. S. Moss and P. I. Wood.

Schroder, E. M. G., technical demonstrator, National Aniline & Chemical Company, Atlanta, Ga. Sponsors: J. E. Moore and H. W. Ormand.

Stafford, Henry A., textile chemist, Ewing-Thomas Converting Company, Chester, Pa. Sponsors: E. C. Bertolet and P. Theel.

Willard, W. H., Southern manager, National Aniline & Chemical Company, Atlanta, Ga. Sponsors: C. H. Stone and J. E. Moore.

Junior Membership

Bergmann, M. M., chemist, United States Finishing Company, Providence, R. I. Sponsors: W. Myers, Jr., and C. K. Wilbur.

Glenn, A. T., dyer, Keystone Finishing Mills, Burlington, N. C. Sponsors: H. L. Seiver and H. W. Ormand.

La Salle, Jos. A., textile colorist, W. C. Durfee, Boston, Mass. Walter C. Durfee and A. K. Hobby.

Miller, H. G., salesman, Grasselli Dyestuff Corporation, Charlotte, N. C. Sponsors: C. H. Stone and J. E. Moore.

Veevers, Arthur, foreman dyer, Glenlyon Yarn Dye Works, Phillipsdale, R. I. Sponsors: H. F. Schwarz and J. P. Vanslette.

Volk, John, dyer, Aberfoyle Manufacturing Company, Chester, Pa. Sponsors: Jos. L. Wade and E. C. Bertolet.

Withdrawn

Martin, John J., care of John Campbell, Providence, R. I.

Storin, Edmund A., 46 Auburn Street, Pawtucket, R. I.

Changes of Address

Goldthwait, Charles F., Mellon Institute of Industrial Research, Pittsburgh, Pa.

Miller, Perceval, 22 Luzon Avenue, Providence, R. I.

Northrup, George A., Jr., 92 Gallatin Street, Providence, R. I.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER
SAMPLE SWATCH QUARTERLY

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
Managing Editor

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APRIL 6, 1925

THE CHEMICAL FOUNDATION SUIT

THE latest and most popular contribution to the literary history of the American dyestuff and chemical industry is the decision presented by the U. S. Circuit court of Appeals, dismissing for the second time the Government's suit against the Chemical Foundation. Although the news of the Government's defeat was the signal for a chorus of congratulations throughout the industry, the happy outcome of the case was by no means unexpected. When the Government lost in the District Court in Wilmington last year it was evident to nearly all that a dozen higher courts could never intelligently and legally reverse the decision. The lengthy trial before Judge Morris and his exhaustive investigation of the entire case gave such wide publicity to the facts involved that defeat for the Government in their appeal to the higher court was generally expected.

Perseverance does not always win—not when it represents stubborn, deliberate refusal to recognize obvious truths of fact and law. The Government was badly whipped in the first court. Stolidly refusing to admit what was undoubtedly a complete defeat, it immediately began new proceedings based upon a long list of alleged errors in Judge Morris' decision. While it battled in the higher court to prove its contentions of error it was wrapping itself in error like a moth in a cocoon. The outcome was inevitable. The three learned judges on the bench of the Circuit Court of Appeals picked the Government's arguments to pieces and left not a thread to cover the absurdity of the entire proceedings.

It is possible that even this latest decision has made no impression upon the Government. But let us generously credit it with some intelligence. Let us hope that this decision has a double action: as it sheds a brilliant light upon the lofty principles that have supported the Chemical Foundation's defense, so may a tiny gleam from that torch penetrate the dull gray minds of those who are directing the Government's suit.

The decision itself, although covering pages, is actually a masterpiece of condensation and brevity when compared to the mountain of technicalities that it batters to smithereens—those same moss-grown technicalities on which the Government blindly constructed its imposing series of briefs. The justices of the Circuit Court have earned the fullest praise of the industry and of America for their industrious efforts and fairminded conclusions . . . for their thorough analysis of each of the charges contained in the Government's argument.

In their decision the judges explain that certain admissions of the Government greatly simplified their task. Among other things the Government admitted that the United States has the power to seize and confiscate enemy-owned property as a war measure and that Congress could delegate to the Alien Property Custodian power to sell such property; and further admitted the power of the Custodian to vest complete title in the purchaser, freeing the property from subsequent seizure by a court of equity. It admitted the legality of a private sale of confiscated property when that sale was authorized by the President in the public interest. These admissions cleared away a mass of confusing argument and enabled the judges to begin directly with the charges put forward by the Government. These charges, by the final decision, are shown, every one, to be unfounded. One by one each allegation is submitted to a rigid scrutiny under the law and one by one each is found wanting in proof.

The Government charged to the first trial court error in its construction of the Trading with the Enemy Act, Section 12, conferring upon the Custodian the power to sell seized property. In their decision the judges enter into an exhaustive analysis of this charge, explaining patiently and in great detail the exact functions and powers of the Alien Property Custodian. They point out that Congress found it necessary to repeal Section 12 and enact in its place a new section giving the Custodian even broader powers. "It is evident that by this amendment," reads the decision, "Congress transformed the Trading with the Enemy Act from a purely conservation measure to one of action. . . . It no longer left the ultimate disposition of seized property in suspense but determined its disposition with finality," giving the Custodian power to dispose of the property "by sale or otherwise." The dismissal of this charge covers pages; the explanation of the legality of the sale under the provisions of the enemy act is complete and convincing.

The next charge concerned the actions of Francis P. Garvan and other officials of the Government and executives of the Foundation. Again it was necessary for a body of learned judges to explain in simple language to the Government how ridiculous were its assertions alleging violation of the Criminal Code by the men who directed the transfer of the patents. In this latest decision the business connections of these men at the time of the sale are fully explained and their acts while in these connections utterly vindicated. When the judges

turned from this to the next charge they left the Government's attack upon these men bare of any support.

Similarly the decision endeavors to make clear to the Government that President Wilson's delegation of authority to Frank L. Polk was unquestionably valid.

In its briefs the Government bewailed the "inadequate price" received for the patents. When the Circuit Court of Appeals investigated this charge they were unable to discover any proof that the price of $250,000 was inadequate when all circumstances surrounding the actual patents and their sale were considered. ". . . The true inquiry is whether the price was adequate under the terms of the actual sale. Put in another way, assuming that the legal or equitable title was in the United States, and assuming of course that the United States had a right to full return for its property, was the price adequate? That depends upon how the patents were sold and what the United States got in return. By authority of the act, which means by authority of Congress, the patents were sold stripped of their characteristic of monopolies and sold on conditions that the United States should have free licenses under all of them and that its citizens should have non-exclusive licenses on equal terms. These, briefly, were the conditions. What did the United States receive? It received the $250,000; it also received licenses under the patents; and it obtained the creation of an industry which stands equipped, manned and maintained in full operation ready to be converted at once into a line of national defense in the event of war. There is no evidence of the value of the licenses which the Government received, nor, very naturally, is there evidence of the value of the national defense in chemical warfare placed in the Government's hands. Yet, we surmise, these things have values, and, taken together, we believe they are greater than the value of the patents at the time of their sale. We are of opinion that the price paid in the circumstances was not inadequate."

Our present Latin American trade is valued at two and one-half times as much as in 1914 and six times as much as in 1900, according to the Trade Record of the National City Bank. Imports from Latin America now exceed a billion dollars a year, and the exports will soon cross the billion-dollar line. They supply us with the tropical foodstuffs and manufacturing materials and take the products of our factories in exchange.

The committee on color of the Federal Specifications Board, at a meeting in Washington, recently, asked the Board to omit from its investigation the fastness of colors used in navy blue, olive drab and khaki uniforms, explaining that there has been a steady improvement in fabrics purchased by the Government from textile mills. The inquiry will therefore be limited to flags, banners and ensigns.

Government Again Loses Suit Against Chemical Foundation

All Points in Judge Morris' Decision Upheld—Case Will Be Taken to Supreme Court

On March 26th, all three judges in the U. S. Circuit Court of Appeals for the Third Circuit affirmed the notable decision reached by Federal Judge Morris in the District Court of Delaware in January, 1924, again dismissing the Government's suit to recover the German dye and chemical patents sold by the Alien Property Custodian to the Chemical Foundation.

After Judge Morris' verdict, it will be recalled, the Government appealed its case to the higher court. This second hearing took place before the Circuit Court of Appeals in Philadelphia on November 10, 1924. Ever since November the decision has been anxiously awaited.

After a most thorough investigation of every piece of evidence submitted, Judges Wooley, Davis and Buffington have concurred in the conclusions reached by Judge Morris, paralleling in every point his decision in favor of the Foundation. By simple deductive reasoning and thorough analysis of all points involved these judges have completely refuted the Government's contention that Judge Morris erred in his decision. By reference to the terms embodied in the Trading with the Enemy Act they have decided that the Alien Property Custodian did not exceed his powers when he transferred the patents by private sale to the Chemical Foundation. They further found that no evidence exists to support the elaborate and libelous charges of conspiracy and criminality made against the officers of the Foundations as well as against representatives of the American dye industry; and that the Alien Property Custodian and other prominent Government officials involved in the transaction are equally guiltless of these charges; that the price of $250,000 paid to the Government for the patents and trade-marks was adequate in view of the fact that the Government and its citizens could obtain non-exclusive licenses thereunder, notwithstanding the Government's assertions that the property was worth millions; and that Francis P. Garvan, although in a double position at the time of the consummation of the sale, as Alien Property Custodian and president of the Foundation, was, in reality, only an officer of the Government at the time the sale was planned and cannot be charged with criminality because of his part in the transaction.

Regarding the contentions of conspiracy upon which much of the Government's evidence was based, this latest decision says in part:

"The Government has insistently pressed its charge of conspiracy throughout the proceedings in the trial court and here on appeal.

"We have therefore kept the subject constantly before us in our study of the case and in our deliberations.

"It will be enough to say that we have found no evidence that sustains either the charge of conspiracy first made against representatives of the industry or the charge

(*Concluded on page 242*)

CORRESPONDENCE

Editor, AMERICAN DYESTUFF REPORTER:

We have taken considerable interest in the editorial, "Guaranteeing Fast Dyes," as published in The REPORTER of January 26th. The subject is certainly one of great importance at this time, and as we are guaranteeing all our fast color work, we thought possibly our ideas might be of interest to you.

We (Bradford Dyeing Association, U. S. A.) are very particular in testing all samples of vat dyestuff as submitted by the manufacturers or agents. We find that the only way to make a true comparison is to test a sample along with the color now in use, dyeing both dyes to the same shade, and then making our fastness tests on the dyed material. We have found that a number of vats are quite fast in medium or heavy shades, but fall down more or less when tested in light tints. This fact is particularly true of a number of the reds and oranges.

It is absolutely essential for the dyer to have all this data at hand; otherwise he may use a dye that is not up to the necessary requirements.

A number of the vat dyestuffs are remarkably fast to some color-destroying agencies, and not so good to others. For example, a certain violet is excellent to light, but not quite so good to washing, while a second violet is practically perfect to washing but not quite as fast to light. The dyer, in using these two colors, could employ the first for dyeing draperies, where fastness to light is most essential, while the second dyestuff will be perfectly satisfactory for dyeing shirtings.

After having chosen a list of colors available for suitable work in the plant proper, we go one step further and test every shade dyed in the works before the goods are allowed to leave the dyehouse. In this manner we check up on the soaping, methods of dyeing, choice of colors and other conditions that may arise. If a batch is found to be a little faulty, it is possible to correct it before it has gone out of the plant.

By following these testing methods, we find we can guarantee our work against sunlight, chlorine, washing and perspiration. We can do so with safety and assurance, for we have a complete understanding of what our dyed goods can stand in the way of color-destroying agencies.

Yours very truly,
BRADFORD DYEING ASSOCIATION (U. S. A.)
P. F. ESTEY, Chemist.

Frederick Kraissl, Jr., former assistant manager of the apparatus division of the Corning Glass Works, has joined the staff of the Emil Greiner Company, 55 Fulton Street, in the capacity of manager of the sales department. The Emil Greiner Company wishes to announce that after May 1st they will be located in their new home at 55 Vandam Street, New York.

INQUIRY DEPARTMENT

All classes of chemical work or advice relating to artificial colors, natural dyestuffs, dyewoods, raw materials, extracts, intermediates, crudes, or dyeing chemicals and accessories in general, will be carried out for readers and subscribers of the AMERICAN DYESTUFF REPORTER by this department.

Inquiries of a minor character will be answered on this page, while major matters involving personal investigation, analyses, perfected processes and working formulas, will, if desired, be treated confidentially through the mails. In answering inquiries which, by their nature, require reference to the products, processes or apparatus of some particular manufacturer we aim to be absolutely impartial. We refer the inquiries to specialists whom we believe to be best qualified to answer them intelligently, and must disclaim responsibility if their reports show unintentional bias. All questions, materials for analysis or letters leading to the opening of negotiations for special work will receive prompt attention if addressed to Inquiry Department, American Dyestuff Reporter, 90 William Street, New York City.

S. C. L.—Question: Could you please give me a recipe of some sort of process that could be used to burn out artificial silk on artificial and silk mixed goods? I mean some sort of mixture that could be applied with a gum on a printing machine so as to leave a design on the piece. Some call it "Damessa."

I also wish to have a recipe for Aniline Black for printing on silk. At present I have a good, deep, rich black that rubs or crocks, which is not desirable. I have tried after-chroming and soaping, but still my trouble could not be avoided.

Answer: We have been trying to get information for you on the process which you called Damessa, but up to date have been largely unsuccessful. Two or three people, who have experimented with this process, tell us that it is next to impossible to print an acid upon artificial silk which will have sufficient concentration to burn out the fibers and which will, at the same time, have sufficient thickness or consistency to prevent its spreading to adjacent parts of the fabric, thereby making the pattern extremely blotchy. We are inclined to believe, however, that there is some way of doing this, but so far have not been able to find anyone who has done it successfully.

One man who has had experience with making these burnt-out designs tells us that the fabric is woven on a jacquard loom or knitted on a jacquard knitting machine, using real silk for the portions which are to be removed and artificial silk for the portions which are to remain in the design. The whole piece is then run through a bath containing fifteen pounds of caustic soda to one hundred gallons of water which burns out the real silk, leaving the artificial silk intact. The web of the fabric itself must, of course, be either artificial silk or of cotton so as not to be attacked by the caustic. This process is known in Germany as "Blauatze."

In regard to your inquiry for a recipe covering the

printing of Aniline Black on silk, we would suggest your using Steam Black—commonly known as "Noir Reduit"—in place of the Aniline Black. This is a simpler process and gives a better color which will not rub or crock.

C. M. C.—Question: For a few months we have been using small quantities of India and China wools, and have been experiencing considerable trouble getting dyestuffs that will dye these wools properly and retain their fastness to washing and especially to stoving.

Some dyes that are fast to stoving on other wools are not fast to stoving on the India wool.

Can you tell me why this is so?

The China wool is very hard to get a good color on with almost all of the dyestuffs, and I would like a little light on this subject also.

All of the dyes we use on these wools are acid colors except the black, which is top chrome.

Under separate cover I am sending you a small sample each of the India and China wool, and will appreciate your advice on this subject as early as you find it convenient.

Answer: We have had these wools tested in the laboratory and find that the principal trouble is that they have not been properly scoured before dyeing.

When dyed as received, without any prior treatment, these wools did not take the color as well as standard wools, nor were they so fast to washing or stoving. However, when given a pretreatment with soap, ammonia and a little carbonate of potash (Pearl Ash) in hot water, using several successive changes of this solution, it was found that these wools dyed nearly as well and retained their color nearly as well as standard wools.

There is present in both of the samples, however, a certain amount of what is known as "kemps"—unformed wool fibers which do not dye well no matter what colors are used. The presence of these "kemps" would make it impossible to get perfect dyeing. With this exception, however, we believe that with the proper scouring suggested above you will be able to get satisfactory results with the colors you are now using.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

NIAGARA BLUE 3RD
(Schultz No. 382)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt and soda ash. In light percentage the addition of soap brightens the shade.

SHADE: Blackish dull violet.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Good.

LEVEL: Dyes level with care.

EXHAUSTS: Well.

FASTNESS TO:
- **Acid:** Against acetic goes slightly greener; much greener with sulphuric.
- **Alkali:** Slightly redder.
- **Chlorine:** Destroyed.
- **Cross-Dyeing:** Will not stand cross-dyeing.
- **Light:** Moderate.
- **Mercerizing:** Moderate.
- **Perspiration:** Moderate.
- **Rubbing:** Fast.
- **Scouring:** Scours off.
- **Steaming:** Moderate.
- **Washing:** Moderate.

DYED BY OTHER METHODS: Diazotized and developed with meta-toluylene diamine, the shade is rendered faster to washing and alkalies.

ON UNIONS: Cotton-wool unions: The wool is much redder.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company, under the name of Niagara Blue 3RD.

ERIE VIOLET 2B
(Schultz No. 385)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Reddish blue.

SOLUBILITY: Excellent.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
- **Acid:** Fast to 10 per cent sulphuric.
- **Alkali:** Redder with lime and soda; fast to 20 per cent ammonia.
- **Chlorine:** Destroyed.
- **Ironing:** Temporarily redder.

Light: Fair.
Rubbing: Crocks slightly.
Sulphur: Fast.
Washing: Average for direct cotton color.

SENSITIVE TO METALS, LIME: Copper turns the shade redder.

OTHER PROPERTIES: Little affected by after-treatment.

DYED BY OTHER METHODS: (See Remarks.)

ON UNIONS: Wool-silk unions: Both fibers the same shade. Cotton-wool unions: The cotton is heavier and the wool redder. Cotton-silk unions: With soap and soda the cotton is darker.

ON OTHER MATERIALS: Silk: Slightly acid bath; gives useful shades fast to water. Wool: Redder shade than on cotton; of practically the same fastness. Paper: Dyes unsized rags and cellulose; not suitable for wood pulps; fast to alkali and fairly fast to light.

DISCHARGING: Does not discharge with hydrosulphite.

REMARKS: Developed with resorcin, the shade is much duller and greener; with 2 per cent soda at 100 deg. Fahr., the shade is redder; with beta-naphthol, the shade is a full navy blue; with beta-naphthol and coppered, the shade is slightly duller; with ethyl beta-naphthylamine, the shade is a bright navy; with alpha-naphthylamine, the shade is fuller, darker and greener; with phenol, the shade becomes a blackish blue.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company, under the name of Erie Violet 2B.

BENZO BLUE 3B

(Schultz No. 391)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt at the boil.

SOLUBILITY: Excellent.

FASTNESS TO:
Acid: Fast against acetic; moderate against hydrochloric.
Alkali: Fast.
Chlorine: Fugitive.
Cross-Dyeing: Will not stand cross-dyeing.
Ironing: Temporarily redder.
Light: One of the poorest blues to light.
Rubbing: Fast.
Sulphur: Fast.
Washing: Bleeds badly.
Water: Bleeds at 104 deg. Fahr.

SENSITIVE TO METALS, LIME: Copper dulls the shade a little and the dyeings come out lighter.

DYED BY OTHER METHODS: After-chromed and coppered, it is faster to light and duller. Developed with beta-naphthol, the shade is dull and reddish; with ethyl beta-naphthylamine, the shade is dull and reddish; with ethyl alpha-naphthylamine, the shade is violet red.

ON UNIONS: Cotton-wool unions: The wool is very light. Cotton-silk unions: The cotton is dyed heavier than the silk in an alkaline soap bath.

PRINTING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Sky Blue R; Cincinnati Chemical Works, under the name of Benzo Sky Blue; Calco Chemical Works, under the name of Direct Blue 3B; Newport Chemical Works, under the name of Direct Blue 3BX; Central Dyestuff & Chemical Company (Selling Agents, H. A. Metz & Co.), under the name of Direct Blue H3G; National Aniline & Chemical Company, under the name of Niagara Blue 3B; Commonwealth Color & Chemical Company, under the name of Trianol Direct Blue 3B.

TOLUYLENE ORANGE G

(Schultz No. 392)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With 20 per cent salt.

SHADE: Bright orange.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Fairly good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Chlorine: Very moderate.
Ironing: Goes yellower with hot pressing.
Light: Moderate, though better than S-362.
Rubbing: Fast.
Steaming: Moderate.
Sulphur: Fair.
Washing: Moderate; bleeds somewhat.
Storing: Not particularly good.

SENSITIVE TO METALS, LIME: Not sensitive to copper.

MACHINE DYEING: Suitable.

OTHER PROPERTIES: Will not dye cold.

DYED BY OTHER METHODS: Coupled with para, gives reddish-brown shades fast to washing and cross-dyeing and discharging white with hydrosulphite. When diazotized and developed, yellowish browns and reddish-brown shades are obtained which are faster to washing and boiling than the direct shades. After-treated with fluoride of chrome improves the fastness to washing greatly, but the shade is somewhat duller. The same effect is produced by copper sulphate.

ON OTHER MATERIALS: Wool: Color goes well on wool in a neutral bath, and on cotton-wool unions both fibers are the same shade. Silk: On silk this color dyes a much yellower shade; the fastness to water and washing is very good. Paper: Suitable; gives a clear back-water.

DISCHARGING: The direct dyeings do not discharge well with hydrosulphite; the coupled dyeings discharge better.

(*Continued on page* 241)

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XI

Dyeing with Basic Colors—Ordinary Topping Process—The Machine Employed—Its Operation and Advantages

By RAFFAELE SANSONE

ALTHOUGH direct dyes applied to white yarns and fabrics yield a large range of good shades, many of these can be brightened or colored to produce specially bright composition effects by the use of a basic dye. Thus, in the last case, blues are topped with basic yellows, or direct yellows with basic blues, direct blues with Rhodamine B, direct pinks with Methylene Blue, etc.; the basic dyestuff being taken up to a certain extent by the dye already fixed in the material, without precipitating this in any way, but rendering it of much greater value for certain materials, and of stronger fastness to light and washing. Among the colors preferred for the purpose are Methylene Blue B, Auramine II, Rhodamine B, Rhodamine 6G, Methyl Violet, etc.

The lakes formed as above between direct and basic colors do not resist high temperature; all topping operations and drying should not exceed 60 to 70 deg. Cent. if decomposition is to be avoided. Besides this, hard water should not be used in the preparation of the baths containing the basic colors, as it produces uneven shades due to precipitation. Peaty matter and the slightest trace of iron also spoil the brightness of the shade. To obtain faster shades the topping with the basic dyestuff is sometimes followed by a treatment with a bath of fresh tannic acid. This is expensive, however, and the difference in fastness acquired is often not great enough to compensate for the cost. It is of great value, as will be seen later, for rendering cotton fabrics faster where the quantity of basic color on the material has been brought above what is possible by the use of ordinary means, with the purpose of further enhancing the beauty of the material.

Small Scale Trials

In many plants the brightening or topping of cotton goods dyed with direct dyes is conducted with any available brand of basic dyestuff without consideration of its advantages for obtaining the best results. Unfavorable results can often be avoided by conducting preliminary trials on a small scale. For this purpose quite a large number of trials are available, among which the colorist generally selects those that suit each case best. Such trials may be for determining which direct colors offer the best results when topped with a suitable brand of Methylene Blue, Auramine, Methyl Violet, Rhodamine, etc.; how far the direct dyes will absorb the basic dyes; with what speed the direct dyes will absorb the basic dyestuff; up to what percentage of absorption the fastest results to light and washing can be obtained with the basic color; if the basic color at disposal in the works can be of service, or if another is of greater value; if the basic color can be employed as a matching color in place of one or more of the direct colors; if two or more basic colors can be used as matching and brightening colors; if some financial and practical benefit can be obtained by mordanting a direct color ground with tannic acid, topping in the basic color and treating with a tartar emetic bath; if advantage is possible, with regard to fastness and brightness of shade, by after-tanning articles of cotton dyed with direct colors and topped; if some advantage is possible through topping cotton fabrics with direct colors that have been previously dyed with basic colors on a tannin mordant; if the direct colors can be brightened to advantage with basic colors during or after chroming; if the direct colors can be brightened to advantage with basic dyestuffs during or after diazotizing; if direct colors that have been topped with a basic dyestuff can be conveniently redyed with the same or different direct colors; if some advantage can be obtained by topping twice with a basic color a cotton fabric previously dyed with direct dyestuffs.

The first of the above trial dyeings is of some importance, for by a convenient choice of the most suitable direct color or colors to be topped, it is often possible to obtain brighter effects; that is, effects containing more of the basic color, which may be fixed by an unfavorable choice, and which, possessing a certain brilliance of their own, greatly assist that of the basic colors. Besides this, faster lakes can also be formed on the material, increasing the value of the articles produced. When it is necessary to cut down expenses the brightest effects may be difficult to produce, the dyer only partly succeeding in this direction. Cases may follow where a careful choice of the direct colors used for the dyeing of the ground can bring about a reduction in the production expenses, and the above trial should never be omitted, especially as through the very large number of colors available on the market a more suitable set of dyes for producing a given shade may be found than by preparing this shade from colors already in use in the works.

The trial for determining how far the direct dyestuff will absorb the basic dyestuff can often be of value, especially when it is desired to incorporate as much as pos-

sible of the direct color to produce the brightest effects; and it can show the way to avoid the use of too much basic dyestuff in the topping bath, which can be regulated to only the quantity absolutely necessary. The investigation of the speed of absorption can also be of value to show if it is necessary to use some retarding agent in the dyeing operations to avoid the production of uneven shades. It can also be useful to show how to obtain the correct shade with the basic dye. This is of importance when only a part of the absorption power of the direct colors on the material is to be utilized. Cases may arise where the client wishes the brightest possible effects, but also insists on good fastness to washing; here the trial to determine up to what percentage of absorption such fastness is satisfactory is to be recommended, as by its means can be indicated the exact quantity of basic color to be absorbed per meter or per kilo of the fabric dyed in the direct dyestuffs, showing the dyer how he must regulate the strength of the dye bath later prepared.

In any dyehouse a certain stock of basic colors is generally available, and it is the custom of the head dyer to consume these before ordering new colors. This does not mean, however, that the first colors are to be employed blindly for topping purposes without submitting them to the necessary preliminary trials against others offered on the market, to determine if they are really more suitable than these for the purpose.

Another test of great value is that to determine if the basic color can be substituted by one or more of the direct dyestuffs employed for the production of the ground to be topped, as in this way brighter effects can follow. Besides this, it may be the only means for matching a pattern supplied by a client. The matching of certain shades on the market may sometimes be impossible through topping a direct color ground only with one basic dyestuff, and it is often well to investigate if two or more basic colors are necessary for this, as it may very well have been dyed in this manner originally. Thus the fabric may have been aftertreated with a mixture of Brilliant Green and Auramine, Auramine and Rhodamine, Methylene Blue and Rhodamine or a mixture containing a large amount of Auramine and a very small quantity of Brilliant Green, etc.

Very often the dyer may need to know if it is of practical benefit to mordant a fabric dyed with direct colors in a tannic acid bath, dyeing it after this in a bath containing one or more basic colors, and treating finally with a tartar emetic bath. A similar necessity may arise from time to time, especially if the direct color ground is simply intended to dull the brilliance of the basic dyestuffs, and to economize on the quantity used.

After-tanning is at present sometimes conducted to render faster the toppings obtained with basic colors. It is expensive, however, and is only really of advantage when the client is disposed to allow something more in his payments for the extra fastness attained. There are, nevertheless, extra bright shades in which the dyer tops his goods so that these contain more dyestuff than can be fixed by the direct color. With these a certain advantage is derived by after-tanning, especially if this is followed by a treatment with tartar emetic, which renders the shades much faster.

There are shades that can only be produced by topping with a bath of a direct color cotton fabrics that have been dyed in basic colors. This bath tones down the brightness of their shade, giving them the required intensity. The assays of the colorist in the laboratory are of great value, for he can show by them up to what shade it is best to dye the basic color ground, afterward to be tinted to the desired shade, thus preventing any waste of dyestuff in the first or second treatment.

It is sometimes necessary to brighten fabrics dyed in direct colors, after a chroming process conducted to increase their fastness to washing; here the work of the colorist can be directed to determine how far the brightening can be carried out without reducing the fastness. Besides this he may be required to choose the basic colors most adapted for the purpose. After diazotizing cotton fabrics dyed in direct colors it is sometimes necessary to reduce the dull appearance of these by brightening with a basic color, applied in a separate bath or in the diazotizing bath itself. Experiments are then necessary in the laboratory to select the colors that yield the best results.

So far it has never been required of a dyer to redye with a direct color a cotton fabric that has been topped with a bath containing one or two basic dyestuffs, except when the shade produced is to be rendered darker or duller, or when the goods have been spoiled by staining, unevenness or other reasons. In such instances preliminary laboratory work can be very useful. Cases may arise when the second topping with the substantive colors can also be of advantage to obtain a stronger fixation of the basic color and to avoid the necessity of after-tanning Neither has it ever been demanded from a dyer to top twice a fabric dyed with direct colors. In special cases a similar process may be of advantage, especially if the material can be dried between the first and second topping, as in this way a greater amount of the basic color remains fixed on the cotton goods and brighter shades are possible than through ordinary single topping processes. Before conducting any such work on a large scale, trials conducted in the laboratory can be a very valuable guide to the foreman dyer, saving him considerable trouble, such as the production of too dark a shade. Without drying, a second topping with a new basic color can be of value for shading purposes.

Ordinary Topping Process

When topping cotton cloth goods dyed in direct colors in the usual way, these, after slightly rinsing, are worked in a cold or tepid bath of the basic dyestuff until the desired shade has been obtained, being washed after this and dried. The direct colors in this way lose the property of bleeding and are converted into insoluble compounds. From ⅛ to ¼ per cent of the basic color is usually used together with 2 to 5 per cent of acetic acid. The dyestuff is sometimes added in portions to obtain

more level shades. The fuller the direct color bottom the more quickly will the basic dyestuff be absorbed. Very careful manipulation is therefore necessary for level results.

Instead of the acetic acid, from 1 to 3 per cent of alum is sometimes employed, calculated on the weight of the cloth.

The treatment of the goods requires two baths, unless the following method be adopted when using the jigger: The cotton cloth is entered in the dye bath as usual, giving it the required number of ends to produce the desired intensity of shade; after this running it as much as possible on one of the rolling shafts. The dye bath is run off and substituted with running water; the bath is given another number of ends, all rinsing fluid is run off and the bath containing the basic or brightening color is entered. In this the required number of ends is given, the bath run off, and the material removed. By a similar arrangement labor cost is avoided, and only one jigger is employed, which can be always used for the same color. Some dyers, however, prefer, especially when dyeing with a standing bath, to top on another plant, where they generally perform the rinsing operations, while others rinse on the hydroextractor, explaining that through a similar arrangement a cleaner material is entered in the topping bath.

A Plant Employed

A plant often employed for the dyeing of cotton fabrics with direct colors in a continuance bath, and their topping in basic dyestuffs by the process indicated above, is constructed on the principle shown in Fig. 1.

This consists principally of two vats (A and B) of trapezoidal shape, and of a metal that will stand the action of acids, alkalies and rust. Both vats are surmounted by

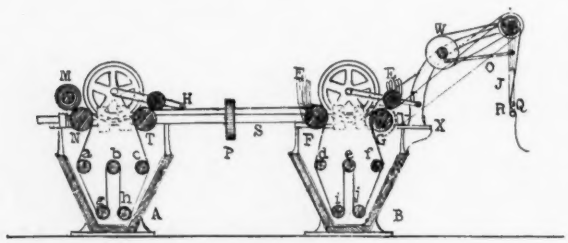


Fig. 1

a strong iron frame bearing the wooden batching or draw rollers N, T, F, G, with friction clutch coupling for forward and backward movement, regulated by the pulling of the free end of the piece being dyed. The frame is supplied with entrance guides (E, E) for the short end shafts of the beams containing the rolls of cotton cloth (M) to be treated, or of a pressing roller (H), which by a special lever arrangement can be made to rest either on the batching beam on one side of the machine, or on the batching beam on the other side.

The two jiggers are driven by a central pully (P) on shaft S, and generally from an upper transmission working other machines, and turned by a small electric motor, or other convenient means. Shaft S is supplied with friction clutches by which it can be made to move the driving mechanism of both machines simultaneously or of only one. The goods to be dyed are wound off from one batch, then pass the dye vat and are batched on again. To give some tension to the cloth the winding roller is provided with a brake.

The interior of vat A contains five small guide rollers of glass or other suitable material (a, b, c, g, h), a copper steam heating coil and a discharge tap, while vat B, although also containing the five small glass guide rollers (d, e, f, i, j) and a discharge cock, does not contain any heating coil; it being intended to conduct the dyeing by starting with a hot bath which is allowed to cool. The end of this last jigger (B) contains a frame (X) supplied with a plaiting mechanism consisting of the wheel W, the moving cage J, the two very small let-out rollers R and Q, and the connecting rod O. At the top of frame X is a collection roller (V), through which the cloth is carried upward before delivery to the small rollers R and Q.

Some jiggers, and especially those constructed by the Waggon und Maschinenbau Aktiengesellschaft of Goerlitz, contain a special arrangement to keep the cloth fully spread; this allows the dye bath to pass through several times in different directions. For the purpose of two batching rollers of each jigger are supplied with a spreading mechanism connected in such a manner as only to function when one of these is used. Another improvement in the above jiggers are the batching rollers. These are supplied with a porcelain cover that greatly facilitates their cleaning.

Operation of the Plant

Work on the above plant requires some practice before it can be accomplished successfully. The dyers enter the short-end shafts of a roll of cloth containing two pieces of one long piece, in the entrance guides on the right of the jigger on the left, and cause its loose end to run first above the batching roller immediately below (T), and then from here directly on the guiding rollers (a, b, c, g, h) where it is carried to the left batching roller (N), to which it is fixed in the most convenient manner.

When such operations have been conducted, and the cloth spread out, eliminating all plaits or folds, the mechanism above vat A is run until most of the roll of cloth has passed to the left batching roller (N), and its end remaining free has nearly left the right hand batching roller (T). The machine is stopped and this end fixed to the roller, the dye bath is again run into vat A, and the machine started.

The cotton fabric is thus run at a certain speed through the dye bath, which is now brought to the required temperature by turning on steam in a coil at the bottom of vat A. When the material has thus made one full passage through the dye bath, a pull on the batching roller N, inverts the movement of the machine and begins to

pass again over this roller; a certain quantity of salt is added to the dye bath to exhaust it, several ends being then given to the material, which should thus be colored to the required shade. It is detached after this from roller T, and while being pressed continually by roller H passes directly to the left hand batching roller (F) of the right hand jigger, to be led to guiding rollers d, e, f, i, j, and fixed to batching roller G. On this the roll of cloth is then run, fixing the end that is in the meanwhile detached from roller N to roller F. After detaching the cloth from batch roller N a tape is joined to this, being detached, however, as soon as batch roller T has been passed; this serves later for drawing a new batch of material through the dye bath in vat A. A bath of rinsing water is then run in vat B, where the cotton fabrics are passed several times; all running water is stopped after this, and vat B is allowed to discharge its contents, after which the tap at the bottom is closed, and the topping bath is introduced. This contains, however, only one quarter of the required quantity of the basic color dissolved in water.

After one passage of the cloth a second quarter of the dyestuff is added; later a third quarter, and after a third the last quarter. The dyeing is then completed, followed by a second rinsing. In the meanwhile, on the jigger on the left side has been introduced a second roll of cotton cloth, and the dye bath there has been strengthened by the necessary additions of dyestuff, water and later of salt. The dyeing is performed as in the preceding case

Advantages of the Plant

The above plant offers several advantages for the topping of cotton fabrics dyed in substantive colors, some of which can be indicated as follows:

1. The dyeing operations can be carried out in a continuous bath, or with a fresh bath each time, as may be required.

2. As the material making its exit from the jigger on the left is pressed continually by roller H the loss of dyestuff is reduced, and the rinsing operations on the jigger on the right can be shortened.

3. The automatic passage of the cotton fabric backward and forward in the bath reduces the work of the dyers who can attend as many as eight machines at a time.

4. By the special arrangements of the plant the cloth can be delivered either in the form of pieces or rolled on the same wooden shaft on which it is entered.

5. Both jiggers can be worked at one time, or singly, as may be required, by the simple movement of shorthand levers.

6. The material being dyed can be submitted or not during its winding on the empty batching rollers to the pressure of the rollers H.

7. Should it be required, both jiggers can be used for dyeing two separate rolls of cloth simultaneously.

(*To be continued*)

DYEING ACETATE SILK

(*Continued from page* 215)

Cent. (176 deg. Fahr.) for one-half to one hour. Rinse well in warm water and then in cold water.

Method No. 2: Scouring Celanese-Cotton Unions.—For Celanese-cotton unions where the cotton requires bleaching, they recommend that the usual alkali boil as given to cotton must be omitted in order to avoid hydrolysis of the Celanese. Scour in an open tub at not over 80 deg. Cent. (176 deg. Fahr.) for forty-five minutes to two hours in a bath containing 2.5 grams of olive oil soap, 2.5 grams of 50 per cent Turkey Red oil and 1 c.c. of 20 per cent ammonia per liter. Then rinse well as in Method No. 1 and it is ready for bleaching by Method No. 10.

Method No. 3: Scouring Lustron-Cotton Unions.—The manufacturers of Lustron recommend that it should be scoured with 10 per cent of neutral olive oil soap and 1 per cent of soda ash, on the weight of the goods, for about one-half hour at a maximum temperature of 80 deg. Cent. (176 deg. Fahr.).

Method No. 4: Scouring Lustron-Cotton-Natural Silk Unions.—Unions containing Lustron and real silk in the gum may be boiled off in one or two changes of a ¾ to 1 per cent neutral olive oil soap solution for about one hour at 93 to 96 deg. Cent. (200 to 205 deg. Fahr.).

Methods Nos. 5, 6, 7, 8 and 9 are given by various dye manufacturers as satisfactory for acetate silk, variety not stated. They are given here merely for comparison.

Method No. 5: Scouring Acetate Silk Alone.—Scour in a bath containing 2 pounds ammonia and 2 pounds neutral soap per 100 gallons of liquor at 45 to 50 deg. Cent. (113 to 122 deg. Fahr.) for twenty minutes. Rinse well as in Method No. 1, and sour in a cold bath containing 1 or 2 gallons of concentrated hydrochloric acid per 100 gallons, turn several times and again rinse well. (Note that the use of mineral acids has been warned against elsewhere.)

Method No. 6: Scouring Acetate Silk Knitted Fabrics.—In scouring knitted fabrics, which usually contain more or less oil, up to 1 gram of soda ash and 1 to 3 c.c. per liter of a Turkey Red oil solvent hydrocarbon emulsion, such as are now common on the market, may be added to the above Method No. 5. Some of the hexalin or tetralin scouring emulsions should be excellent for this purpose.

Method No. 7: Scouring Acetate Silk Alone.—Scour at 45 deg. Cent. (113 deg. Fahr.) with a solution containing 2 per cent hard soap and 4 per cent ammonia, on the weight of the fabric, for twenty minutes. Rinse in two waters and sour in a bath containing 2.5 per cent of 30 per cent hydrochloric acid, on the weight of the goods, and finally rinse.

Method No. 8: Scouring Acetate Silk-Cotton Unions.—Still another variation for unions is recommended. Scour at 75 deg. Cent. (170 deg. Fahr.) in a bath containing 1 or 2 pounds of Monopole soap per 100 gallons

of liquor. If the cotton is unbleached, use a slightly higher temperature, 80 to 85 deg. Cent. (175 to 185 deg. Fahr.), and rinse the goods as in Method No. 1.

Method No. 9: Scouring Celanese.—Scour in a solution containing ½ pound each of soap and ammonia to each 10 gallons of liquor at 65 deg. Cent. (150 deg. Fahr.) and rinse as in Method No. 1.

Bleaching Acetate Silk

Where pale or brilliant shades are to be dyed it may be necessary in some cases to bleach the fabric containing acetate silk. The manufacturers of Celanese recommend that this should be done according to the following method:

Method No. 10: Bleaching Celanese.—Treat for one hour in a cold 0.25 deg. Tw. sodium hypochloriate solution. This bath may be prepared as in Method No. 11 or from soda ash and chlorine, as for the regular cotton bleach. The bath may be either neutral or acidified slightly with acetic acid just before using. If the neutral bath is used, the goods may be acidified in a separate dilute acid bath after leaving the bleach. The bleached Celanese should then receive an antichlor treatment, as given in Method No. 13.

Method No. 11: Bleaching Lustron-Cotton-Viscose Unions.—The Lustron Company advise the use of hypochlorite on either Lustron-cotton or Lustron-cotton-viscose unions. Prepare a stock hypochlorite solution from 10 pounds calcium hypochlorite (bleaching powder) and 6 pounds soda ash in 50 gallons of water. Allow this to settle and use the clear liquid.

Make up the bleach bath for use at 0.5 to 0.75 deg. Tw. from the above clear liquor, or from soda ash and chlorine direct as mentioned in Method No. 10. After scouring as in Method No. 3, bleach in this bath at 25 to 30 deg. Cent. (77 to 86 deg. Fahr.) for one hour. Rinse lightly and sour in a cold ½ per cent acetic acid solution for fifteen to twenty minutes. Wash until about neutral, then neutralize in a bath containing ¼ per cent of sodium bicarbonate for one hour, as in Method No. 27. Hydroextract and dry without rinsing, or if the goods are to be dyed, rinse and proceed with the dyeing.

Method No. 12: Bleaching Lustron-Real Silk Unions.—The Lustron Company recommends the peroxide method of bleaching for unions containing natural silk. To prepare 100 gallons of bleach bath, add to each 97 gallons of cold water 11 pounds of 56 per cent acetic acid, free of iron. Then sprinkle sodium peroxide slowly into the water while stirring well to prevent undissolved peroxide from sinking to the bottom of the vat. When about half the peroxide has been added, start heating the bath slowly to 38 deg. Cent. (100 deg. Fahr.). Continue adding peroxide while heating until the bath reacts neutral to litmus paper. Usually about 4 pounds of sodium peroxide are required to make up the neutral bath. After the neutral point is reached, heat the bath up to 49 deg. Cent. (120 deg. Fahr.) and add 2 pounds of Monopole oil. Mix well and enter the goods as quickly as possibe at 49 deg. Cent., maintaining this temperature until the proper bleach is obtained. After bleaching, rinse first in water at 49 deg. Cent. and finally in cold water.

Method No. 13: Antichlor Treatment for Celanese.—The British Celanese Company recommends that after the hypochlorite bleach, as in Method No. 10, the Celanese should have an antichlor treatment for fifteen minutes in a cold bath containing 0.5 to 1 gram per liter of sodium bisulphite. This should be followed by a thorough rinsing.

The acetate silk is now ready for dyeing; and as the basic dyes were possibly the first to be used on this fiber and, in fact, are still used largely for certain purposes, we will consider them first and follow this with a discussion of the other well-known dyes which have been or are used on acetate silk, such as the acid, mordant, sulphur and vat dyes. We will then consider the saponification method of dyeing and the newer classes of dyestuffs developed particularly for acetate silk—i. e., the ionamines and the dyes applied by the colloidal dispersion methods.

(*Part III will appear in an early issue*)

NEW WIRE CLOTH CATALOG

A new 64-page catalog has just been published by the Newark Wire Cloth Company, Newark, N. J. The catalog includes complete information with list prices on double crimped heavy steel wire screens; regular coal screens; steel wire cloth; bran duster grade of cloth; tinned mill screen cloth; brass, copper and bronze wire cloth; market grade brass and copper wire cloth; and extra fine phosphor bronze wire cloth. It also illustrates several grades and explains in detail the Newark Metallic Filter Cloth which was originated and developed by the Newark Wire Cloth Company. The catalog goes into the uses of Monel metal in considerable detail. Five pages are devoted to new U. S. Standard Testing Sieves in whose manufacture this company were the pioneers. A graph showing the relation between the U. S. Standard and other standards is included as well as price lists of U. S. Standard Sieves and "market grade" testing sieves. Five pages in the back are devoted to tables such as are needed by users of wire cloth. Many photographs are shown to illustrate the multitude of weaves, spaces and combinations used in the manufacture of wire cloth, the largest shown being 1 inch by 1 inch and the finest a twill weave 325 meshes to the inch, the diameter of the wire being .0014 inch and the opening .0017 inch. In the forepart of the catalog a photograph of the new factory is shown and a number of pages are devoted to pointers on selecting, ordering and examining wire cloth. Users of wire cloth and all who may have need of it in the future should have a copy of this handy and valuable catalog on file.

Technical Notes from Foreign Sources

Improving Cotton

By the simultaneous or successive action of carbon disulphide and alkali solution of not less than 12 per cent strength on cotton yarns or fabrics containing cotton, including mixed goods containing cotton and animal fibers, a translucent effect with a silky luster or a stiffening effect may be obtained, depending on the nature of the cotton material and duration of the treatment. In order to obtain a silky luster the material must be stretched either before or after the treatment.

The process may also be applied to mercerized cotton or cotton that has been treated with strong acids, zinc chloride solution, etc.

For example, cotton fabric is impregnated under tension for a period of time varying from a few seconds to fifteen minutes with carbon disulphide, optionally in admixture with from one to five times its weight of benzene. The fabric is then squeezed out and treated with 14 to 20 per cent of a solution of sodium hydroxide for some minutes up to several hours. Alternatively the stretched fabric may be treated with a 12 to 18 per cent solution of sodium hydroxide contained from 0.2 to 0.3 per cent of carbon disulphide. The material is subsequently washed or acidified and washed and dried.

The process is patented in British Patent No. 216,476.

Multiple Colored Fabrics with Cotton and Wool Fibers

There are various processes which are used for manufacturing multiple colored fabrics. Of particular interest is the process which is called the Mommer method, but concerning which little has been published. This process is concerned with the preparation of multiple colored fabrics from cotton, wool and half wool.

It consists in weaving together mordanted and unmordanted threads. The resulting fabrics are then dyed with such dyestuffs as fix themselves both to the mordanted and the unmordanted fibers, but in doing this different color tones are obtained.

For example, a cotton yarn is impregnated with a solution of iron phosphate in ammonium hydroxide, and this mordanted cotton is woven with unmordanted fibers. Then if the fabric that is made in this manner is dyed with Diamine Scarlet in a bath which contains a definite proportion of sulphuric acid, the mordanted threads will be colored a bluish red, while the unmordanted threads will come out a brilliant red. Then again, when Diamine Yellow is used as the dyestuff, a green color is obtained on the mordanted fibers while the unmordanted will be dyed yellow. If in addition to the substantive dyestuffs logwood is also employed in a solution that has been made alkaline with sodium carbonate, then the logwood will fix itself only on the mordanted fibers, while the unmordanted fibers will retain the pure color tone of the substantive dyestuff.

Cotton is mordanted with chromium salt and these fibers are then woven together with unmordanted cotton and woolen fibers. The goods that are manufactured in this manner are mordanted with a mixture of cream of tartaric and sodium bichromate. There is obtained in this manner a black fabric with a white border. Alizarine colors will yield similar effects when used in this manner. On the other hand wool that has been mordanted with chromium salts may be woven together with unmordanted wool. Then if the cloth obtained in this manner is boiled with logwood, this coloring matter will fix itself only on the mordanted wool, while the rest of the fabric remains white, and then it can be dyed in a special process with fuchsine to give a red color. Then again, cotton fibers may be mordanted with alumina and interwoven with cotton which has been mordanted with an iron mordant in the fashion indicated above. To this mixture there may be added unmordanted cotton and wool. The finished cloth is then mordanted with bichromate of potassium and cream of tartar and finally colored with Alizarine Red. Violet, red and white pattern effects are then obtained on a Bordeaux background. (Deutsche Faeber Zeitung, 1924, 789.)

Bleaching of Cotton Goods Mixed with Silk

The bleaching of cotton goods which are mixed with artificial silk or provided with artificial silk borders and headings is a problem that offers certain operating difficulties. A very interesting account of certain methods which may be safely applied to such fabrics is contained in the Textile Recorder, 1924, pages 63ff.

The important factor is the manner in which the artificial silk has been woven into the fabric. If the proper precautions are taken in this operation, then the bleaching will not produce bad results, but if the proper allowance is not made for the shrinkage of the artificial silk fibers during and after the weaving process, by weaving under a definite tension, then trouble will be encountered. This happens when the silk is wetted. Another important matter is the manner in which the artificial silk is sized, and the character of sizing materials employed. It is stated that the best size of use for the artificial silk is a form of soluble starch or a thin boiling starch or gelatose gum. The

addition of a little gelatine or gum tragacanth is also of advantage. As a rule, the size is made of such strength that it contains about half a pound of starch in each gallon of the mixture.

It is definitely stated that if the weaving and the sizing have been carried out in the proper manner, then the bleaching can be carried out without any fear that bad results will be obtained. The process outlined below is said to give excellent results with the viscose silks manufactured in England.

The first step in the process is to singe the goods. They are then steeped in water or in a bath of Diastafor, then washed and boiled in a high pressure kier with a solution of sodium hydroxide, 2 deg. Tw. or a 3 per cent solution of sodium carbonate. The next step is to wash them again and then to sour in hydrochloric acid or sulphuric of ½ to 1 deg. Tw. They are washed again and chemicked with a solution of sodium hypochlorite of ½ to 1 deg. Tw. After washing again the goods are soured in acid at ½ deg. Tw. concentration and finally washed to remove all traces of acid.

Instead of souring after washing to remove the chemic liquor clinging to the goods, the cloth may be run through a solution of sodium bisulphite and then well washed. The addition of tetralin to the kier solution will assist in the removal of the fats used in sizing the cotton yarn as well as the natural fats and waxes found in the cotton fiber. This has the effect of reducing the time of boiling.

A modified process of bleaching the goods is given in the following: The cloth is first singed, then treated with Diastafor, then washed and scalded in open kiers or on a jig with a mixture of soap and tetralin. This process lasts for eight hours. The goods are washed again, soured in hydrochloric acid of ½ to 1 deg. Tw., washed well and chemicked in a solution of sodium hypochlorite from ½ to 1 deg. Tw. After washing, the cloth is passed through a solution of antichlor, containing 1 ounce of sodium bisulphite in a gallon of water. The cloth is then washed for the last time.

The amount of soap required in this treatment is about 1 ounce to 1 gallon of water, and the amount of tetralin one quarter of per cent on the weight of the cloth. The use of antichlor in preference to souring after chemicking is indicated in all cases where the source of the silk is doubtful. In all cases where colored cotton stripes are present in the fabric, the modified process should be used because many of the coloring matters employed in dyeing cotton fabrics, especially the vat colors, will not stand boiling without marking off.

The processes of steeping, washing, boiling, souring and chemicking are carried out in suitable jig apparatus. Chemicking and souring are carried out in wooden tubs to which overhead winches are fixed. Instead of showering the cloth with the solutions, the former is passed through the baths and allowed to come in with the air, as it passes out of the bath and then in again. The winch draws the cloth through the baths in this manner.

It remains, however, that the chief difficulty arising in the bleaching of cotton fabrics which contain interwoven artificial silk fibers is the uncertainty of the source of the silk. It makes a great deal of difference as to how the silk was made as far as bleaching results are concerned. The preliminary test on samples of cloth that contain the artificial silk is therefore of great importance. This test is generally carried out by boiling the cloth in a kier along with goods which are found to withstand the treatments that have been described above.

Bleaching Textile Fibers

Textile fibers are subjected to the action of circulating boiling liquor which contains 2 ounces of a detergent powder to the gallon of liquor. This detergent powder is composed of equal parts of crystalline sodium carbonate and sodium bicarbonate. The liquor also contains half a per cent of a solution of sodium hypochlorite or 52 deg. Tw. concentration, having a density of 1.26. The operation is carried out in a kier and lasts for a period of from two to six hours. After this treatment the fabric is thoroughly washed and bleached in the usual manner with a solution of sodium hypochlorite of ½ to 2 deg. Tw. concentration, density from 1.0025 to 1.010, which contains from one-quarter to one-half an ounce of the detergent powder per gallon. Dyed textile materials are desized with warm but not boiling liquors. (British Patent No. 214,079.)

Steaming Ciba Colors

Steaming in the presence of much moisture is necessary for the satisfactory development of Ciba colors on the printed fabrics. This condition is preferably obtained by passing the printed fabrics, immediately before they enter the steaming chamber, between two rollers, the upper one being made of rubber and the lower one of roughened copper, immersed in a viscous solution which contains gum tragacanth and glycerine. The addition of 5 grams of beta-naphthol dissolved in the minimum quantity of caustic soda per liter of the gum-glycerine mixture assists in the production of much brighter shades. (Bulletin of the Society of Mulhouse, volume 90, pages 93 to 94.)

Batik Discharge Patterns

A discharge paste containing a wax-repellent substance is printed on dyed fabrics, which are then passed through a bath which contains wax at a temperature of 80 deg. Cent., whereby the dyed ground is discharged. Subsequently the fabrics are gathered together, broken, dyed and dewaxed in the usual manner for batik dyeing. The process is particularly suitable for wool plush, velvet and other heavy fabrics, and the engraved portion of the printing roll is prefer-

ably at least one millimeter deeper than usual. A suitable discharge paste consists of 100 grams of rongalite, 300 grams of gum, 100 grams of water and 500 grams of gum tragacanth thickening of 6.5 concentration. This process is patented in British Patent No. 214,507.

Coagulating Bath in Artificial Silk Making

In order to obtain a thread of cellulose xanthogenate which can be worked up with ease into the finished artificial silk fabric, possesses of the requisite brilliancy and elasticity, it is necessary to use a coagulating bath which is properly composed. According to French Patent No. 561,073, such a bath contains from 13 to 15 per cent of ammonium formate and from 13 to 18 per cent of sodium formate. After coagulation has taken place with the aid of this bath, the xanthogenate is decomposed by treatment with a weak solution of acid. Ammonium formate is used at a minimum concentration for neutralizing the free soda from the viscose. The sodium formate is employed at minimum concentration for the purpose of obtaining coagulation of the cellulose derivative.

DYESTUFF TABLES

(*Continued from page* 233)

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Toluylene Orange Y; Amalgamated Dyestuff & Chemical Works (Selling Agents, John Campbell & Co.), under the name of Amidine Orange GG; National Aniline & Chemical Company, under the name of Erie Orange Y; Newport Chemical Works, under the name of Toluylene Orange GR.

AMANIL YELLOW CGR

(Schultz No. 394)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Bright yellow.

SOLUBILITY: Good.

LEVEL: Dyes level.

FASTNESS TO:

Acid: Fast to dilute acids.
Alkali: Does not stand alkali; the shade goes redder.
Ironing: Fast against hot pressing.
Light: Excellent.
Rubbing: Fast.
Steaming: Excellent.
Washing: Excellent; does not bleed with neutral soap when after-treated.

SENSITIVE TO METALS, LIME: Very sensitive to copper and lime.

OTHER PROPERTIES: Suitable for pad dyeing.

DYED BY OTHER METHODS: After-treated with chrome and copper, this color gives tan shades of excellent fastness to washing.

ON UNIONS: Cotton-wool unions: The wool is dyed heavier than the cotton.

ON OTHER MATERIALS: Wool: Dyes wool in a neutral or acid bath. The shade is fast to light, but not fast to soaping.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Yellow CGR.

DIAMINE BLACK BO

(Schultz No. 403)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Direct, with salt; diazotized and developed with beta-naphthol.

SHADE: Bluish black.

FASTNESS TO:

Acid: Fast.
Alkali: Fast.
Ironing: Fast.
Light: Fair.
Rubbing: Fast.
Washing: Moderate; bleeds off somewhat.

DYED BY OTHER METHODS: Diazotized and developed with beta-naphthol, gives a dark blue; with meta-toluylene diamine, a reddish black.

ON UNIONS: Cotton-wool unions: The cotton is dyed much heavier than the wool, which is only stained. Silk-effect threads in a soap and soda bath are left fairly clean.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Black BOL.

Charter has been granted Sanders, Smith & Co., Inc., Charlotte, N. C. This firm has organized to buy, sell, treat, dye and manufacture cotton and all its products. Harry L. Sanders and A. L. Smith are the incorporators.

It is reported that E. S. Yarborough, president of the Henderson Hosiery Mills, Henderson, N. C., will head the proposed fine goods weaving plant to be established in Durham, N. C.

The Roessler & Hasslacher Chemical Company make the interesting announcement that they are now producing Tri-Chlorethylene and Tetra-Chlorethane. Their manufacture is an entirely new development in this country, although this company has been importing them for several years. The value of these solvents in the dyestuff industry has been definitely established, as they possess the inestimable advantage of being non-inflammable.

GOVERNMENT AGAIN LOSES CHEMICAL FOUNDATION SUIT

(*Concluded from page* 231)

of conspiracy later made against officers and agents of the Government."

Francis P. Garvan's participation in the sale is vindicated in the decision as follows:

"When Mr. Palmer made the contract of sale, Mr. Garvan was an officer of the United States serving his Government without compensation, being one of that class generally known as 'dollar-a-year-men.' He was not then an officer of the Chemical Foundation. When, later, he became Alien Property Custodian and also president of the Chemical Foundation, there was present the element of two official positions, and in these positions, it was true, he carried out the contract previously made but there was lacking the element of a direct or indirect interest on his part in the pecuniary profits or contracts of the Foundation, for he agreed to serve as its president without compensation and he has kept his agreement. He has not received from it any money for any purpose, even for his expenses. Moreover, the by-laws of the corporation provide that the president and vice-president shall serve without pay."

Judge Buffington disagreed in one particular with the conclusions reached by the other members of the court, maintaining that in his judgment the twelfth section of the enemy act imposed a personal duty upon President Wilson and that consequently he could not legally delegate that detail of authority to Custodian Polk. But he agreed that as the President later ratified the acts performed under the delegation, such acts should be held to be entirely valid.

It is probable that the Government will again appeal the case, this time to the Supreme Court. In this connection it is learned that former Attorney-General Harlan F. Stone, who argued the case for the Government in the Circuit Court of Appeals in Philadelphia, and who, since the Philadelphia trial, has been appointed an Associate Justice of the Supreme Court, will not, because of his previous connection with the case, be eligible to sit thereon should the Government carry an appeal to the Supreme Court.

A PUZZLE AMONG US

Among the advertisements in this issue of The Reporter is one that is certain to attract attention and hold interest because of its unusual nature. This advertisement, by a well-known advertiser, is in the form of a picture puzzle. A reward is offered for a solution if this is accompanied by a description of the nature of the product advertised.

An advertiser spends his money because he thinks he has something which will be of benefit to certain of our readers. But it is always a question with him whether the announcement will be seen. If not seen the reader will not be informed and the advertiser wastes his money. Many devices have been adopted to attract the reader's attention, such as large displays, colored inserts, marginal embellishments, pictures, etc. But even if these are noticed by the man to be attracted he may not be ready to act upon the invitation extended by the announcement.

To make it still more puzzling this ad is not signed; but since the subject of the ad is identified with the manufacturer who has been before the textile trade for twenty years and by reason of his uncommon style of advertising is known to all our readers, this part of the puzzle should present no particular difficulty.

The Long Island Knitting Mills, Inc., Long Island City, N. Y., have been chartered under State laws with a capital of $50,000 to operate a local plant. Karelson & Karelson, 87 Nassau Street, New York, are the company representatives. C. and E. Fromer and R. Adler are the incorporators.

The large plant of the Textile Dyeing Company at Fairlawn, N. J., valued at $2,000,000, will be ready for opening in about a month and will employ approximately 1,000 people. The home office of the company is in Switzerland, although the works here will be operated altogether by American officials. The capital was furnished by the home office.

The B. & G. Silk Mills, 142 Market Street, Paterson, N. J., have been organized to buy, sell, manufacture, work, prepare, treat, and in all ways handle and deal in silk, wool and other textile fabrics of all kinds, together with the threads and raw materials entering into the composition of the same. Capitalization $100,000, par value $100; Ruben Brietstein, of Paterson, and others, are the incorporators.

DYESTUFF SALESMAN

WANTED—Experienced dyestuff salesman for New York State and Connecticut by well-known color manufacturer offering a large line of both domestic and imported colors. Excellent opportunity for man who can make good. Give age and experience. Confidential. Address Box 290, American Dyestuff Reporter.

SALESMAN WANTED

Salesman to cover New York City and vicinity by large domestic manufacturer and importer. Must have a following. Address Box 292, American Dyestuff Reporter.

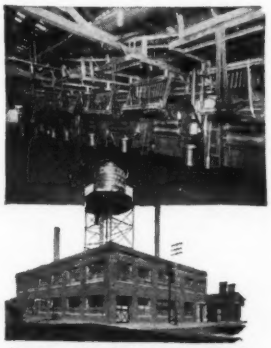
PROCESSES WANTED

Processes for making good dyestuffs. Will buy outright, royalty or arrangements as agreed. Firm in Brooklyn. Address Box 293, American Dyestuff Reporter.

Battery of skein dyeing machines in plant of Caledonian Dye Works, Philadelphia, Pa. Machines lined with Monel Metal by EMIL SCHAEFER CO., PHILADELPHIA. Monel Metal color cans and dippers also supplied by EMIL SCHAEFER CO.

Quick changes from one color to another when dyeing machines are Monel Metal lined

Battery of Monel Metal lined warp dyeing machines in Caledonian Dye Works. Linings fabricated and fitted by EMIL SCHAEFER CO.



Exterior of Caledonian Dye Works, Philadelphia—boosters for Monel Metal dyeing equipment.

THE DYER who uses the old type of wooden kettle wastes dyestuff by absorption and must lose from three to twelve hours boiling-out time when changing from a dark shade to a light tint. What a handicap to profitable production!

Monel Metal skein and warp dyeing machines change all this. For Monel Metal machines can be cleaned instantly—no scrubbing or scraping or boiling. With a Monel Metal machine you can use the same machine for all colors.

Monel Metal is practically standard in the dyeing industry because of its rare combination of properties. It won't rust—it resists corrosion and it is as strong as steel.

The natural result is real economy over a period of years. Why not Monel Metallize your plant—either by relining and refitting with Monel Metal, or by installing new Monel Metal equipment?

To get all the facts about this superior dyeing equipment, *write us today.*

ASK FOR "LIST B" OF MONEL METAL & NICKEL LITERATURE

THE INTERNATIONAL NICKEL COMPANY
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Monel Metal is a technically controlled Nickel-Copper alloy of high nickel content. It is mined, smelted, refined, rolled and marketed solely by The International Nickel Company. The name "Monel Metal" is a registered trade-mark.

INCo Monel metal

NOW READY

COLOUR INDEX

in the English Language

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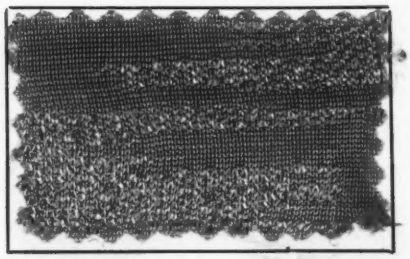

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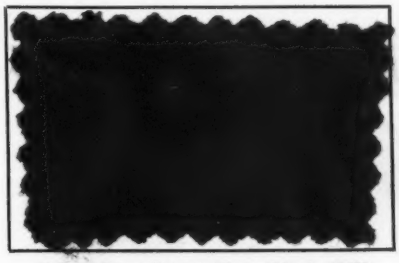

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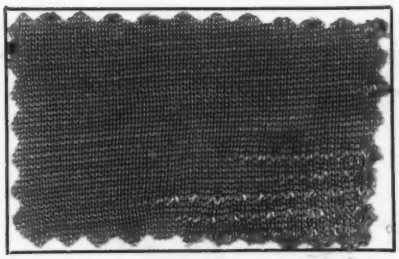
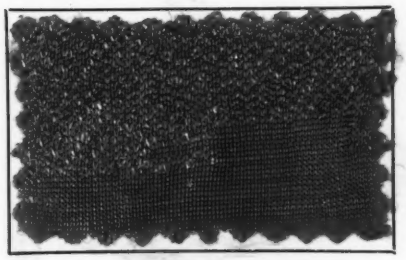


⅛ Per Cent Noil Cotton Black 3G

6 Per Cent Noil Cotton Black 3G



⅛ Per Cent Noil Cotton Black G

3 Per Cent Noil Cotton Black G

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140-156 West 108th Street New York City

Noil Direct Fast Black HW
Noil Cotton Black 3G
Noil Cotton Black G

All the above colors are exceedingly soluble and level dyeing. They are very fast to acids, alkalis, hot pressing, perspiration and storing. They possess excellent fastness to light and discharge a clear white.

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Noil Cotton Black 3G is particularly suitable for mode shades and blacks. Celanese and Lustron are left unstained.

Noil Cotton Black G is recommended for mode shades and navy blues. Celanese and Lustron are left unstained.

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Stocks are carried by responsible distributors in all textile centres. Inquiries will receive prompt attention.

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Tetranil colors for direct dyeing with after-treatments of Metallic Salts for extra fastness to washing and light.

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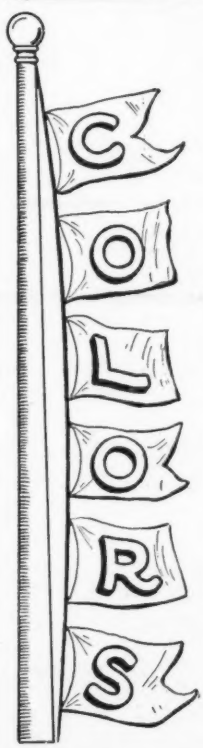

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Silk Brown R
[Reddish Cast]
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Two extraordinary products directly appealing to Dyers of Silks, Woolens and Unions.

They excel in level dyeing qualities, affording, as well, highly desirable results when dyed in neutral or even slightly alkaline baths.

Both may be relied upon for a dependable fastness to all ordinary agencies.

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American Dyestuff Reporter
90 William St. New York City

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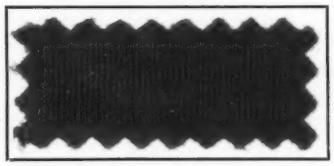
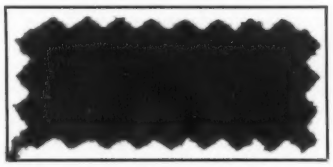


.26 % National Erie Violet 3 R
.124% National Erie Fast Brown 3 RB
.016% National Diazine Black H Extra

NASTURTIUM

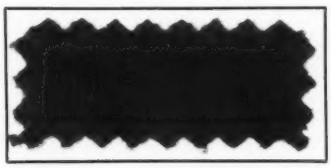
3.3 % National Erie Fast Orange A
.24% National Erie Fast Orange CG
.22% National Erie Catechine B

CASTILIAN RED
On Bleached Material



2.4% National Erie Fast Scarlet 4 BA
.6% National Erie Fast Scarlet YA

TORTOISE SHELL



2.2 % National Erie Catechine 3 G
.55% National Erie Catechine B
.24% National Erie Fast Yellow WB

GOBELIN

.85% National Solantine Blue 4 GL
.15% National Solantine Black L

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Especially recommended for all purposes where fastness to light and washing is essential. They are suitable for machine dyeing through their excellent solubility; also particularly recommended for unions of silk, cotton and artificial silk in which all fibres are dyed alike. Rosanthrene Fast Colors are not sensitive to copper.

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Fastness to atmospheric influence

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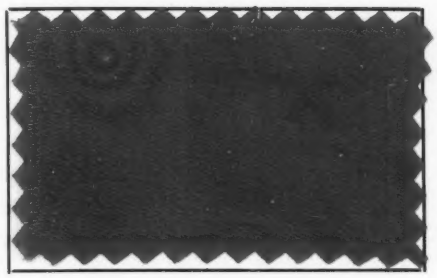
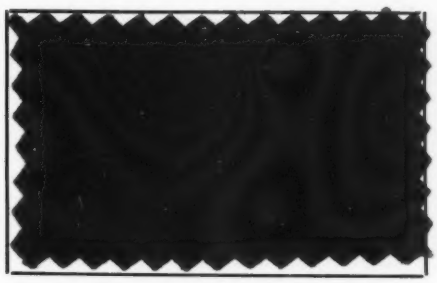


10% AKCO Sulphur Tan YY



5% AKCO Sulphur Sky Blue 5B

Other AKCO Sulphur Colors are:

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AKCO Sulphur Yellow GX Conc.
AKCO Sulphur Yellow RX Conc.
AKCO Sulphur Yellow ATR
(withstands after-treatment well)
AKCO Sulphur Tan R Conc.
AKCO Sulphur Tan Y Conc.
AKCO Sulphur Olive G
AKCO Sulphur Olive 2G
AKCO Sulphur Brown BF
AKCO Sulphur Brown CB
AKCO Sulphur Cutch Brown 5R
AKCO Sulphur Red Brown 3R
AKCO Sulphur Green B Conc.
AKCO Sulphur Bordeaux R Conc.
AKCO Sulphur Bordeaux R Extra Conc.
AKCO Sulphur Bordeaux B Conc.
AKCO Sulphur Bordeaux 3B Conc.
(copper free)

AKCO Sulphur Cerise
AKCO Sulphur Purple
AKCO Sulphur Violet
AKCO Sulphur Blue 2R Conc.
AKCO Sulphur Blue R Conc.
AKCO Sulphur Navy Blue RL Extra
AKCO Sulphur Blue GL
AKCO Sulphur Blue 4B Extra
AKCO Sulphur Indigo B
AKCO Sulphur Indigo BG
AKCO Sulphur Deep Indigo
AKCO Sulphur Deep Indigo B
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